

EXHIBIT A

**Amended Expert Report of Nolan McCarty, Ph.D.
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***Hagopian, et al. v. Dunlap, et al.,*
U.S. District Court for the District of Maine**

July 27, 2020

TABLE OF CONTENTS

Table of Figures and Tables.....	ii
Expert Qualifications	1
Summary of Findings and Analysis.....	2
Background.....	3
Analysis.....	5
I. RCV Resulted in a Significant Number of Maine Voters Not Fully Participating in the 2018 Maine Elections.....	5
A. Exhausted Ballots in RCV Elections	5
B. Fully Participating Ballots	9
C. Comparing Participation in Maine’s RCV with Plurality and Runoff Systems	13
D. Who Truncates Their Ballot and Risks Exhaustion?	16
II. Low Full-Participation Rates in Maine Cannot Be Explained by Voter Choice or Expression	22
III. The Purported Benefits of RCV Are Non-Existent.....	23
A. Effects on Smaller Parties.....	23
B. Effects on Turnout and Engagement.....	24
C. The Spoiler Effect.....	27
D. Non-Majority Winners.....	28
Conclusion	28

TABLE OF FIGURES AND TABLES

Figure 1: Exhausted Ballots for 98 RCV Elections	6
Figure 2: Exhausted Ballots and the Number of Candidates	7
Figure 3: Ballot Exhaustion Over Time.....	8
Table 1: Correlates of Ballot Exhaustion.....	8
Figure 4: Example of Cast Ballots in Maine 2nd Congressional District Election	9
Table 2: Non-Strategic Voter Categories.....	11
Table 3: Exhaustion, Votes Not Counted, and Lack of Full Participation	13
Table 4: Dropoff Rates in Plurality Runoff Elections	14
Table 5: Full Participation Rates Across Election Types	16
Figure 5: Exhausted Ballots and Age.....	18
Figure 6: Exhausted Ballots and Education	19
Figure 7: Truncated Ballots and Education	19
Figure 8: Truncated Ballots and Age	20
Table 6: Maine Second Congressional District General Election 2018	20
Table 7: Maine Democratic Gubernatorial Primary 2018	21
Table 8: Maine Second Congressional District Democratic Primary 2018.....	22
Figure 9: Rates of Total Undervoting in 2018 Contested State Senate Elections	25
Figure 10: Total Undervoting in 2018 Competitive State Senate Elections.....	26
Table 9: Comparison of Total Undervoting in 2018 RCV Elections and State Senate Elections	26

EXPERT QUALIFICATIONS

I am the Susan Dod Brown Professor of Politics and Public Affairs at Princeton University and currently the Director of the Princeton Data-Driven Social Science Initiative. I recently concluded my service as Chair of the Department of Politics at Princeton University, and I was formerly the associate dean at the School of Public and International Affairs at Princeton University. I specialize in U.S. politics, democratic political institutions, and political game theory, with a research focus on political polarization and ideology and statistical voting analysis. I studied ranked-choice voting (“RCV”) in preparation for publication of my book, “Polarization: What Everyone Needs to Know,” which was published in July 2019 and includes a discussion of RCV.

I received my Ph.D. and M.S. in Political Economy from Carnegie Mellon University and my A.B. in Economics with Honors from the University of Chicago. I have taught graduate-level courses (Ph.D.) in game theory and political theory, American political institutions and a variety of political and methodology classes at Princeton University and Columbia University. I have also taught courses in business, legislative politics, and advanced econometrics at the master’s level at Princeton University and the University of Southern California. Additional information about my professional experience as a political scientist and economist, including prior expert testimony, publications, and affiliations, can be found in my curriculum vitae, attached as Appendix A.

I have been asked by attorneys for Plaintiffs to examine the effects of RCV on voter participation in the State of Maine, and how participation in RCV systems in Maine and elsewhere compares to plurality and runoff systems. I have also been asked to evaluate the purported benefits of RCV identified by RCV supporters.

In order to perform this analysis, I have reviewed data from 98 municipal RCV elections, cast-ballot data from the 2018 Maine Second Congressional District general election (“2nd CD election”), 2018 Maine Democratic Congressional primary election (“Congressional primary”), and the Democratic Gubernatorial primary election (“Gubernatorial primary”), the 2020 Maine Republican Congressional primary election (“2020 Congressional primary”), voter registration and commercial records for Maine voters who participated in the 2018 general election (“Maine voter file”), election-return data from the 2018 Maine state senate elections, data on the 2018 Congressional elections in California and Washington, and data on majority runoff elections. A description of the data sources relied upon for this report is attached as Appendix B. My analysis is guided by my training and experience as a political scientist and economist, including my work with statistical voter analysis and RCV.¹

I am being compensated for my time in preparing a report and preparing or providing any testimony. My billing rate is \$400 for services performed in connection with this matter. In addition, I will be reimbursed for all reasonable out-of-pocket expenses incurred in connection

¹ My conclusions stated herein are based upon my review of the information available to me at this time. I reserve the right to alter, amend, or supplement these conclusions based upon further study or based upon the availability of additional information.

with my analyses and testimony in this case. My compensation is not dependent on the outcome of this matter or the opinions expressed.

SUMMARY OF FINDINGS AND ANALYSIS

The following is a report of my empirical findings and analysis, which demonstrates:

1. RCV has resulted in a substantially lower “full participation” rate in Maine as compared to plurality and runoff systems, where “full participation” means casting a ballot that could not be exhausted and thus is guaranteed to count toward the final outcome. This is particularly true in jurisdictions like Maine with more elderly and less-educated voters.
2. These results, as well as the high number of ballots cast that lack any clear rational explanation, demonstrate that the low “full participation” rate in Maine cannot be explained by deliberate voter choice alone. Indeed, the results demonstrate that voter confusion causes many voters not to fully participate. The inherent complexities of the system are preventing voters from fully participating and thus effectively disenfranchising large numbers of voters.
3. The purported benefits of RCV have not manifested in jurisdictions where RCV has been utilized over long periods of time.

As I outline in my report, an RCV system comes with a significant number of vices, many of which manifested themselves in the 2018 Maine elections.² Chief among them is that the system provides many significant impediments to full participation of the voters who choose to cast ballots. Central to this issue is the phenomenon of *exhausted* ballots. In an RCV election, ballots may become unusable in later rounds of tabulation when the voter has failed to rank any of the candidates that remain in contention. When such a ballot is cast aside after the first round of voting for this reason, it is said to be exhausted, and it is no longer counted for purposes of determining the “majority” winner. The academic literature and the analyses in my report demonstrate that ballot exhaustion is pervasive in RCV elections, sometimes leading to the discarding of over 20% of the ballots during the final round of tabulation. It also appears to be persistent, as rates of exhaustion do not decline over time. Jurisdictions that have used RCV for decades suffer from ballot exhaustion at similar rates as new adopters of the voting system.

The direct reason why ballot exhaustion is so pervasive is that voters rarely rank a sufficient number of candidates. Whenever a voter does not rank all of the candidates, she runs the risk of having her ballot exhausted. Unfortunately, because of the uncertainties in the level of support for various candidates, a voter may have a difficult time predicting whether or not her ballot will be exhausted. Moreover, the academic literature and my analysis of the 2018 Maine elections suggest a high likelihood that older and less-educated voters are most likely to vote an incomplete ballot, and thus, are most likely to submit an exhausted, uncounted ballot. These

² I use the term “2018 Maine elections” to include the 2nd CD election, Congressional primary, and Gubernatorial primary. In addition to the 2020 Congressional primary data discussed below, these are the only RCV elections to have taken place in Maine with reported data on individual ballots. The state does not report data on individual ballots for RCV elections that are resolved in the first round of tabulation.

findings are troubling in that scholarly work has established that such incomplete (or *truncated*) ballots can affect election outcomes in ways that are not transparent to voters and may work against their interests.

In addition, full participation in RCV is low compared to plurality and runoff elections. In plurality elections, full voter participation is the rule, and there are relatively few voters who fail to achieve full participation if they choose to vote at all. Even in a runoff election—which requires voters to choose to and make efforts to vote on two separate occasions and typically take place in primary elections that receive lower voter turnout in general—the percentage of exhausted ballots in an RCV election is not substantively different from a runoff election. But, in states where the majority runoff election occurs on the Federal Election Day, voter turnout actually *increases*, demonstrating a better performance than RCV in producing majority winners and better second-round voter participation.

These results demonstrate that the low full-participation rate in Maine cannot be explained by voter choice or expression alone. As demonstrated by the analysis below, the lack of full voter participation in Maine is due to problems inherent to RCV elections. The complexities of the system are causing voter confusion that is preventing many voters from fully participating.

Finally, as I outline in this report, the purported virtues of RCV are not realized by adoption:

1. There is little evidence that RCV improves the fortunes of smaller parties. Comparisons of legislative election outcomes in Australia, where RCV has been used since the 1920s with other Anglophone democracies, reveal that RCV does not encourage small party electoral success.
2. Similarly, there is little evidence that RCV boosts turnout or voter engagement. In fact, the academic debate on this point is consistent that voter turnout declines with the use of RCV. Original analyses demonstrate that Maine voters were no more attracted to voting in RCV elections than the plurality elections on the same ballot.
3. RCV does not eliminate “spoiler effects” or opportunities for manipulation. Instead, RCV changes the nature of the opportunities for strategic behavior and manipulation.
4. RCV does not guarantee that the winner receives a majority of the vote. In fact, the winner of an RCV election that goes beyond the first round fails to obtain support from a majority of voters most of the time.

BACKGROUND

The use of RCV has gained traction over the past several years. In such systems, voters are asked to rank a set of candidates, and those rankings are then used to determine the election winners. An RCV system generally works as follows:

- Voters are asked to rank the candidates. In some systems, they can rank all of the candidates while others ask only that the voters rank up to a certain number of candidates.

- The first rank votes are counted. If any candidate receives a majority of the first rank votes, she is declared a winner. If there is no majority winner, the last place candidate, as well as any additional candidates that have been mathematically eliminated, are dropped.
- The votes are recounted using the first ranked votes of the remaining candidates and the second ranked votes of those who supported one of the eliminated candidates.
- If a candidate obtains a majority on this round, she is the winner. If not, the process continues until there is a winner.

Maine's RCV system generally follows these principles. *See generally* Me. Rev. Stat. tit. 21-A, § 723-A. In general, if no candidate receives more than 50% of the first-choice votes based on election returns, the RCV count proceeds to successive rounds of voting. "At the end of each round, if more than 2 candidates remain, the last-place candidate is defeated, and the vote for the next-highest-ranked continuing candidate on the defeated candidate's ballots is then counted in the next round. . . . In the final round, when only 2 continuing candidates remain, the candidate with the most votes in that round is the winning candidate." 29-250-535 Code Me. R. § 4.2(A).

Advocates of RCV tout many virtues. RCV, advocates contend, improves the electoral fortunes of small parties and independent candidates. By encouraging a larger set of candidates to contest office, advocates argue that voters are provided with more choice, which in turn should result in greater voter turnout and engagement. RCV elections also purportedly eliminate the possibility of spoiler candidates who siphon off too many votes from the most popular major candidate. Finally, RCV elections are said to be more legitimate because the winner has earned the support of a majority of the electorate.

Officials and RCV interest groups in Maine have made similar arguments. The Committee for Ranked Choice Voting in Maine, for example, asserts that

[RCV] gives more choice and more voice to voters. With RCV, you have the freedom to vote for the candidate you like best without worrying that you will help to elect the candidate you like least. Ranked Choice Voting eliminates vote-splitting and ensures that candidates who are opposed by a majority of voters can never win.³

The same group has also contended that RCV in Maine increases voter participation in democratic elections, reduces negative campaigning, results in greater choice for voters, and restores "majority rule."⁴

³ The Committee for Ranked Choice Voting, <http://www.rcvmaine.com/> (last visited July 19, 2020).

⁴ *See e.g.*, The Committee for Ranked Choice Voting, *FAQ: What are the benefits of voting with a ranked choice ballot?*, http://www.rcvmaine.com/what_are_the_benefits_of_voting_with_a_ranked_choice_ballot (last visited July 19, 2020) (listing as benefits of RCV: "restores majority rule," "eliminates vote splitting," "more voice for voters," "more choice for voters," and "reduces incentives for negative campaigning" (capitalization altered)).

Were these virtues demonstrable, it might be difficult to argue against the advocates of RCV. Unfortunately, however, RCV imposes substantial costs. Most important, it results in substantial disenfranchisement of voters, as demonstrated in the 2018 Maine elections and the 2020 Congressional primary. Moreover, the electoral history of RCV as practiced in U.S. municipalities, other national legislatures, the 2018 Maine elections, and the 2020 Congressional primary fails to provide much evidence at all that the purported benefits of RCV have materialized.

ANALYSIS

I. RCV HAS RESULTED IN A SIGNIFICANT NUMBER OF MAINE VOTERS NOT FULLY PARTICIPATING IN MAINE ELECTIONS

A. Exhausted Ballots in RCV Elections

A major problem observed in RCV elections is that increasing numbers of ballots cease to be relevant to the outcome of the election as the vote tabulation proceeds. In an RCV election, a ballot may become *exhausted* if the voter has not ranked a currently viable candidate. For example, if a voter ranks only one candidate and that candidate is eliminated in round 1, that voter contributed nothing to the second round voting tabulations, because an exhausted vote is no longer counted for purposes of determining the “majority” winner.⁵ Specifically, a voter’s ballot may be exhausted if any of the following occur:

1. She has ranked only candidates who are no longer viable;
2. She has *overvoted* by selecting more than one viable candidate for highest rank of her viable candidates; or
3. She *undervotes* by skipping columns or rankings.⁶

My use of the term “exhausted ballot” is slightly narrower than as defined under Maine law. Under Maine law, a ballot can be “exhausted” even in the first round of voting if a voter leaves their ballot blank or overvotes in the first round. By contrast, I use the term “exhausted ballot” to refer to only ballots that are exhausted after the first round of tabulation—*i.e.*, ballots that successfully ranked at least one candidate before being exhausted. I use the term “total undervotes” or “all undervotes” to refer to both exhausted ballots—as defined herein—and ballots that are left blank in the first round of tabulation. Lastly, I use the term “ballots not counted” to refer to all ballots that are not tabulated in the final round. This term is slightly broader than “total undervotes” because it also includes first-round overvotes. In other words, “ballots not counted” is synonymous with Maine’s statutory definition of “exhausted ballots.”

⁵ See 29-250-535 Code Me. R. § 4.2(A).

⁶ Under Maine regulations, an undervote occurs only if two or more rankings are skipped. See 29-250-535 Code Me. R. § 4.2(B)(2)–(3).

Previous research has shown that high numbers of exhausted ballots are a pervasive phenomenon in RCV elections.⁷

To supplement these results and provide some additional empirical evidence concerning the prevalence of exhausted votes, I conducted a statistical analysis of a data set of 98 RCV general elections held in the U.S. from 2006 to 2019. These elections are restricted to those conducted under RCV rules and required more than a single round to determine the winner. Thus, they exclude those for which a candidate received a majority on the first round of balloting.

Figure 1 below provides the frequency distribution of the percentage of ballots that were exhausted during the RCV counting process for the 98 elections in the first dataset.⁸ Clearly, large numbers of exhausted ballots are the norm. The most typical RCV election (a circumstance that arose more than ten times in the dataset) is one where 8% of the ballots are not counted in the final round. On average, 10.8% of votes cast in an RCV election are considered exhausted. But a large number of elections had ballot exhaustion rates of 20% and higher. Indeed, 15 of the 98 RCV elections resulted in more than 20% of cast ballots being exhausted.

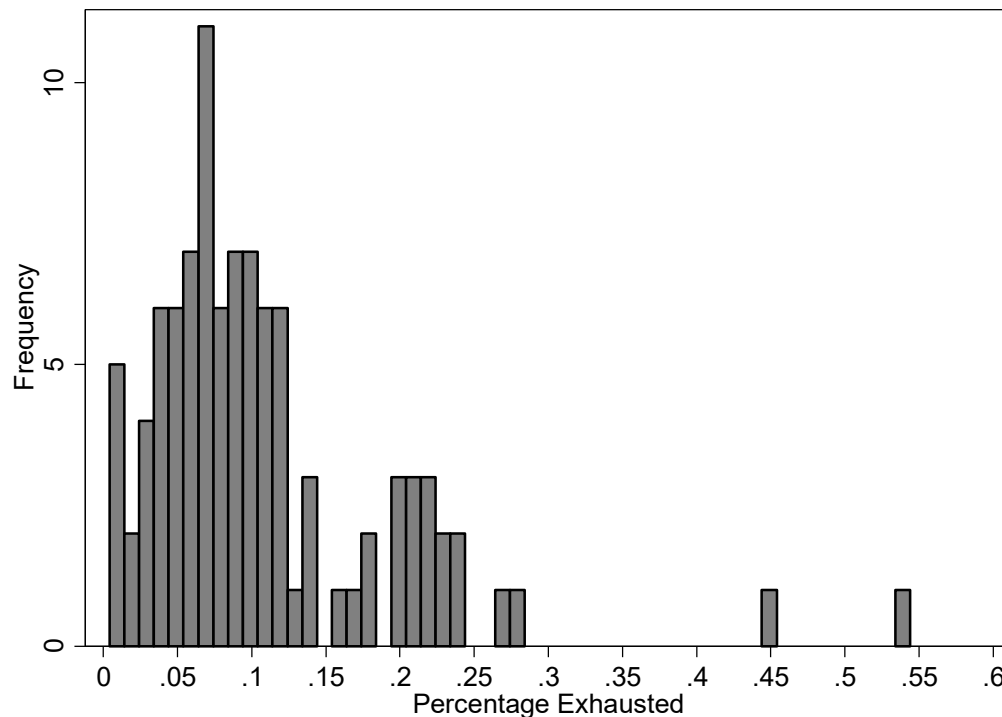


Figure 1: Exhausted Ballots for 98 RCV Elections

The number of exhausted votes across these elections depends on several factors, the most important of which is the number of candidates in the election. Figure 2 shows the relationship

⁷ See Craig M. Burnett and Vladimir Kogan, “Ballot (and Voter) ‘Exhaustion’ Under Instant Runoff: an Examination of Four Ranked-Choice Elections,” 37 *Electoral Studies* 41–49 (2015); Francis Neely and Jason McDaniel, “Overvoting and the Equality of Voice Under Instant-Runoff Voting in San Francisco,” *California Journal of Politics and Policy* 7(4) (2015).

⁸ As noted above, exhausted ballots exclude the over- and undervotes from the first round.

between ballot exhaustion and the number of candidates where the line shows the best linear relationship.

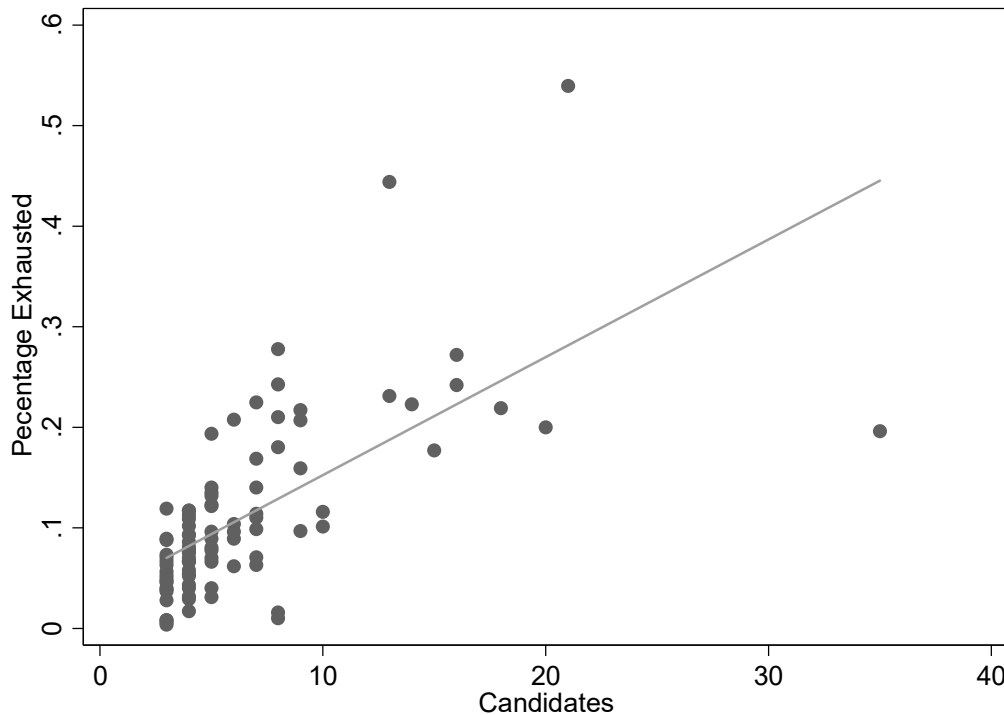


Figure 2: Exhausted Ballots and the Number of Candidates

There is a strong relationship between ballot exhaustion and the number of candidates. And, as demonstrated by Figure 2, the rate of ballot exhaustion only increases with the number of candidates in an election. This is due to the fact that voters rarely rank all of the available candidates, and they rank a lower percentage of candidates when there are large numbers of them. If all voters ranked all candidates, there would be no exhausted votes. If they ranked a constant proportion of candidates, the rate of exhaustion would not increase with the number of candidates running. Accordingly, the increasing rate of ballot exhaustion is consistent with the idea that ranking large numbers of candidates is confusing for most voters and that confusion only increases as the number of candidates increases.

A common defense by RCV advocates is that voter confusion and the effects of cognitive constraints will diminish over time as voters get used to the system. That conjecture can also be tested on these data. Figure 3 plots the rate of exhausted ballots against the number of times that the jurisdiction has used RCV.

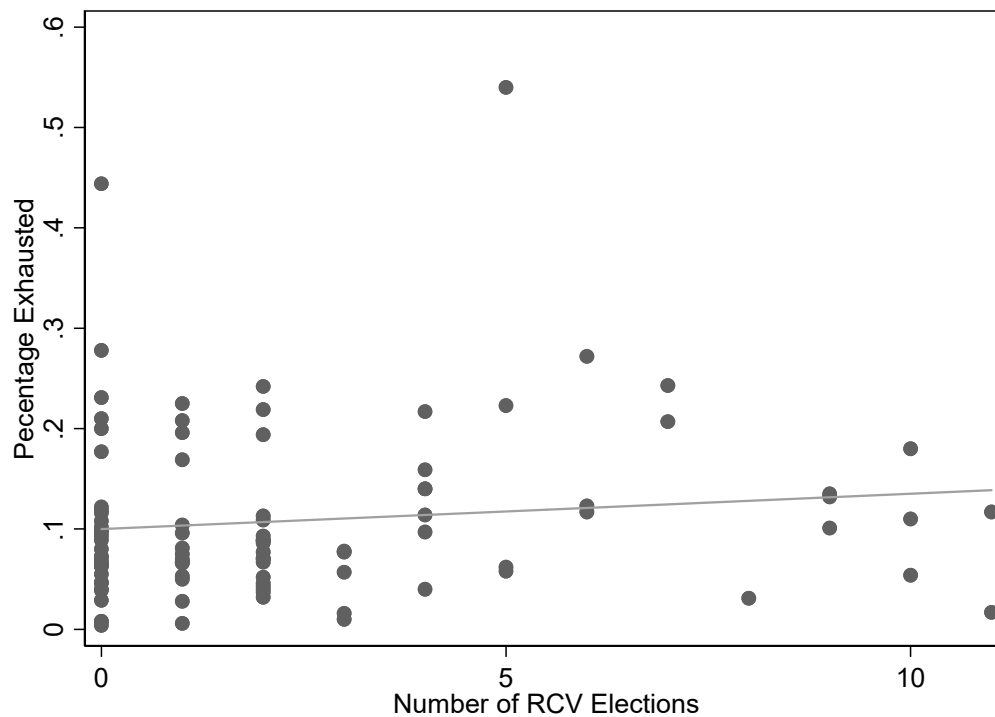


Figure 3: Ballot Exhaustion Over Time

Contrary to the advocacy, there is no empirical evidence that ballot exhaustion rates decline with more experience. Indeed, despite repeated practice with RCV elections, Figure 3 demonstrates that high ballot exhaustion rates do not improve over time. Thus suggesting that the voter confusion discussed above is not based merely on the introduction of a new system but is due to problems inherent in the RCV election system.

To demonstrate the robustness of the bivariate relationships in Figures 2 and 3, I estimate a multivariate regression of the ballot exhaustion rate on the number of candidates and the number of previous RCV elections. I add a few additional control variables such as an indicator for whether it was a mayoral election (the highest profile elections in the dataset) and the natural log of the number of votes (also to capture higher profile elections).⁹

Table 1: Correlates of Ballot Exhaustion	
Variable	Coefficient
Number of Candidates	0.013***
	(0.002)
Number of RCV Elections	0.000
	(0.002)

⁹ See Francis Neely and Jason McDaniel, “Overvoting and the Equality of Voice Under Instant-Runoff Voting in San Francisco.” *California Journal of Politics and Policy* 7(4) (2015).

Mayoral Race	-0.072***
	(0.021)
Ln(votes)	0.011**
	(0.005)
Constant	-0.071
	(0.046)
N	93
R Squared	0.529
Standard errors clustered by jurisdiction in parentheses	

There is a strong relationship between exhausted ballots and the number of candidates running. Each additional candidate in an RCV election adds a 1.3 percentage point increase in exhausted ballots. In contrast, the effect of the number of elections is zero to three decimal places. Thus, RCV advocates are incorrect to claim that RCV performs better over time. Instead, the evidence shows that an increase in election candidates has a direct correlation to exhausted ballots in that election, and this problem remains over time.¹⁰

B. Fully Participating Ballots

Data on the individual vote records in Maine RCV elections can allow for a closer look at the behavior of voters in RCV elections.¹¹ These data contain a record of every vote cast. Under Maine's balloting procedures, voters are asked to provide the candidate that they place in ranks 1 through $n+1$, where n is the number of candidates.¹² A voter may undervote at any rank by leaving that column blank. A voter may overvote by identifying two candidates for a single rank. Nothing precludes a voter from ranking the same candidate at two or more positions. Figure 4 provides an illustration of what the Maine ballot data looks like.

	A	B	C	D	E	F	G	H
1	Cast Vote Record	Precinct	Ballot Style	Rep. to Congress 1st Choice District	Rep. to Congress 2nd Choice District	Rep. to Congress 3rd Choice District	Rep. to Congress 4th Choice District	Rep. to Congress 5th Choice Dis
2		1 Fayette	CAN Ballot Style 130	REP Poliquin, Bruce (5931)	REP Poliquin, Bruce	REP Poliquin, Bruce	undervote	undervote
3		2 Fayette	CAN Ballot Style 130	REP Poliquin, Bruce (5931)	undervote	undervote	undervote	undervote
4		3 Fayette	CAN Ballot Style 130	DEM Golden, Jared F. (5471)	Bond, Tiffany L.	undervote	undervote	undervote
5		4 Fayette	CAN Ballot Style 130	REP Poliquin, Bruce (5931)	DEM Golden, Jared F.	Bond, Tiffany L.	DEM Golden, Jared F.	Hoar, William R.S.
6		6 Fayette	CAN Ballot Style 130	REP Poliquin, Bruce (5931)	undervote	undervote	undervote	undervote

Figure 4: Example of Cast Ballots in Maine 2nd Congressional District Election

The votes in Figure 4 are simply the first five rows of the data, but one can see the large number of anomalies. First, none of these voters successfully ranked all four candidates. Voter 1 voted for Bruce Poliquin in ranks 1 through 3 and then left 4 and 5 blank. Voters 2 and 6 only voted for Poliquin and then left the rest blank. Interestingly, voter 4 chose Jared Golden as her second and fourth ranked candidate. Importantly, none of these voters' ballots was exhausted as each

¹⁰ That mayoral races have lower rates of ballot exhaustion is consistent with voters ranking a higher proportion of candidates in high profile elections, but larger electorates appear to produce more exhausted ballots.

¹¹ These data are available from the Maine Secretary of State, Bureau of Corporations, Elections, and Commissions, <https://www.maine.gov/sos/cec/elec/results/results18.html#Nov6> (last visited July 22, 2020).

¹² The additional slot is included for write-in candidates.

ranked one of the candidates that made it to the final round (Poliquin and Golden). But all of the ballots except that of voter 4 could have been exhausted if the balloting had turned out differently. For that reason, the number of exhausted votes generally understates the magnitude of the problems voters have in casting RCV ballots.

To empirically quantify the magnitude of this issue, I define a *fully participating voter* in an RCV election as a voter who ranks at least $n-1$ distinct candidates in an n -candidate election and does not overvote at any of the ranks.¹³ Full participation ensures that the vote cannot be exhausted and therefore is certain to be counted in the final tally, regardless of how the tabulation of votes plays out. I will refer to ballots that are not fully participating as *truncated*.

Aside from reducing the likelihood that a voter's ballot is counted in each round, truncated ballots also negatively impact the outcomes of RCV elections. Recently, D. Marc Kilgour, Jean-Charles Grégoire, and Angèle M. Foley conducted a simulation study of the consequences of truncated ballots in RCV elections.¹⁴ The authors found that ballot truncation is very common and hard to rationalize. But more importantly, the authors demonstrated how some of the supposed salutary properties of RCV fail when voters do not fully participate. First, they find that even small amounts of truncation can alter the identity of the election winner, especially in elections with more than three candidates. Often these distortions disadvantage and result in outcomes that are contrary to the will of the voter whose ballot is truncated.

Second, Kilgour and his colleagues evaluate the quality of the election by assessing whether the election produces a *Condorcet winner*. A Condorcet winner is a candidate that is preferred by a majority of voters in every pairwise comparison with another candidate. Electing such a candidate when one exists is therefore a crucial desiderata for evaluating electoral systems. Yet Kilgour and his colleagues found that ballot truncation reduces the likelihood that the election outcome will produce the Condorcet winner.¹⁵ In other words, Kilgour found that the winner of the RCV election may have been less successful if she had faced another candidate in the final round of voting – a direct contradiction of advocates' claims that no candidate can win a RCV election without majority support.

Finally, the authors noted that the effects of truncation are unpredictable, even for voting theorists such as themselves:

We regret that we cannot give any intuition that might “explain” our simulation results. Compared to other election methods, competitive ranked-choice elections are opaque, in that it is very difficult to predict whether and how small changes in votes will affect the winner. Indeed, that is the very reason that a simulation is necessary to answer our question about the effects of ballot truncation. (p. 216).

¹³ Ranking the last candidate is unnecessary since there can be at most $n-1$ rounds of voting. Similarly, using the last ballot slot is also superfluous unless the voter casts a write-in vote in one of the earlier ranks. That 7.4% of the voters placed a candidate in rank 5 demonstrates a fundamental lack of understanding of how the system works.

¹⁴ D. Marc Kilgour, Jean-Charles Grégoire, and Angèle M. Foley, “The Prevalence and Consequences of Ballot Truncation in Ranked-choice Elections” 184 *Public Choice* 197–218 (2020).

¹⁵ In other words, suppose that a majority of voters prefers A to B and a majority prefers B to C; the authors found that ballot truncation reduces the likelihood that A wins an RCV election.

That is, even with the benefit of their research, Kilgour and his colleagues found that the large numbers of truncated ballots in RCV election ballots lack any strategic rationale.

Using the cast ballot data described above, I can calculate the percentage of Maine's Second Congressional District general election voters in 2018 who met this standard for full participation. Only 36% of voters in this election satisfied the most stringent version of this criteria by using ballot ranks 1-3 to rank three distinct candidates. This low level of voter participation is due to the fact that 60.6% of voters did not use at least one of the first three ranks and another 3.5% repeated the same candidate more than once in the first three ranks. Under Maine voting regulations, a voter may skip a single rank without exhausting her ballot. Therefore, a ballot with up to two non-consecutive skips may also be considered fully participating. But only 37.7% of Maine voters met the less stringent criteria by filling out three rounds of voting with non-consecutive skips, demonstrating that approximately two-thirds of Maine voters in the 2nd CD election were at risk of not having their ballot counted.

As pointed out by Kilgour and his colleagues, there is no strategic reason for a voter to undervote in an RCV election. Instead, the large number of ballots that fail to rank three candidates in rounds 1-3 demonstrates that the problem is inherent to RCV elections. For example, Maine's rules regarding ballot skips are a source of confusion for voters. In addition to the data noted above, 44 Maine voters had their ballots invalidated because they skipped two ranks between an eliminated candidate and an otherwise valid vote for a continuing candidate. Another 307 votes were discarded because the highest ranked candidate appeared in rank 3 or lower on the voter's ballot.

Interestingly, of the 6018 voters who undervoted in the first round of voting, only 5711 marked zero candidates. Thus, the 307 voters whose highest ranked candidate appeared in rank 3 or lower intended to vote in that race but miscast their ballot. While some of these cases may reflect an expressive vote against a candidate by simply ranking him or her last, that pattern accounts for the minority of these cases. Just 135 voters used only the fifth ballot position (including those that cast an overvote in that rank).

Indeed, as shown in Table 2 below, a significant number of Maine voters who participated in the 2nd CD election cast votes that similarly defy any clear strategic or logical reason. This wide variety of incorrect, and even ineffective, balloting demonstrates that ballot-exhaustion, and the risk of ballot-exhaustion due to truncated votes, cannot be attributed to voter choice.

Table 2: Non-Strategic Voter Categories		
Category of Voter	Number of Ballots	Percent of Total Ballots
Skipped at least one round of voting between candidates (<i>e.g.</i> , Candidate A, blank, Candidate B)	11,569	3.9%
Filled out at least one round but left the first round blank (<i>e.g.</i> , blank, Candidate A, Candidate B)	810	.3%

Ranked the same candidate in non-consecutive rounds (<i>e.g.</i> , Candidate A, Candidate B, Candidate A)	1842	.6%
Ranked one candidate consecutively and also ranked at least one other candidate on the ballot (<i>e.g.</i> , Candidate A, Candidate A, Candidate B)	824	.3%
Ranked (i) only one candidate (ii) more than once but (iii) left at least one round blank (<i>e.g.</i> , Candidate A, Candidate A, blank)	1346	.5%
Overvotes (<i>e.g.</i> more than one candidate at the same ranking)	1994	.7%
Total (Excluding Duplicates Between Categories):	17352	5.9%

To show that the results from Maine's 2nd CD election are not anomalous, I repeat the exercise for the 2018 Democratic Gubernatorial primary election.¹⁶ In that election, there were seven declared candidates so the ballot allowed for eight ranks. For the ballot data, I calculate that only 35% of the voters fully participated by ranking six distinct candidates (allowing for single skips). Not only did a large number fail to rank six candidates, I also calculate only 50% of voters ranked at least four distinct candidates. While that seems better than the performance in the 2nd CD election, it resulted in a situation in the second round of counting where the margin between the 1st and 2nd candidate and the margin between the 3rd and 4th candidate was less than the number of exhausted votes. Had more voters fully participated in the 2018 Gubernatorial primary, the outcomes could have easily been influenced.¹⁷

Similarly, I repeat the exercise for the 2018 Democratic 2nd Congressional District primary election. In that race, there were four candidates. When accounting for single skips, I find that only 47% of the voters fully participated in the election.

Finally, I have conducted the same exercise for the 2020 Republican 2nd Congressional District primary election. Two features of the 2020 Congressional primary made voting far less complex than in the other Maine elections analyzed. First, the 2020 Congressional primary had only three candidates. Second, the ballot did not contain an additional ranking slot for write-in candidates. Therefore, full participation required ranking only two candidates over three slots. Despite the relative ease of full participation, only 26,677 of the 46,805 votes cast fully participating ballots (59.1%).¹⁸

Thus, in each 2018 RCV election held in Maine for which I have cast ballot data, less than half of participating voters cast a ballot that ensures their vote would be counted. And in 2020, where the ballot was as simple as possible in an RCV election, only 59.1% of voters cast a ballot that ensured their vote would be counted. To demonstrate this point more fully, Table 3 provides a

¹⁶ I could not analyze voter choice for the 2018 Senate election or the 2018 Congressional primaries in the First Congressional District or the Republican primary in the Second Congressional District because Maine does not report cast ballot data for RCV elections that resolve in the first round.

¹⁷ Similar to the 2nd CD election, a large number of voters (6.6%) used the superfluous eighth rank.

¹⁸ In this calculation ballots with a skip between the two candidates and those where one of the two candidates is ranked twice are considered fully participating.

summary calculation of (1) the number of ballots that were not fully participating in the four Maine RCV elections and thus risked exhaustion, (2) the number of ballots that were actually exhausted in each of the three Maine RCV elections, and (3) the number of ballots that were not counted in the Maine elections.

Table 3: Exhaustion, Votes Not Counted, and Lack of Full Participation				
	2018 2nd CD Election	2018 Congressional Primary	2018 Gubernatorial Primary	2020 Congressional Primary
Absolute Number of Ballots Not Reflecting Full Participation	184,276	26,715	86,166	20,128
Percent of Ballots Not Reflecting Full Participation	62.3%	52.5%	65.1%	40.1%
Absolute Number of Exhausted Ballots	8,253	1,747	8,714	3,352
Percent of Total Ballots Exhausted	2.7%	3.4%	6.6%	7%
Absolute Number of Ballots Not Counted	14,706	7,381	15,000	7,710
Percent of Total Ballots Not Counted	10.5%	14.5%	11.3%	16.5%

C. Comparing Participation in Maine's RCV with Plurality and Runoff Systems

To demonstrate the risk of disenfranchisement in Maine, it is useful to compare the low voter participation rates in RCV elections with their counterparts in plurality and runoff elections.

In a plurality election, full voter participation is defined as casting one ballot for the race in question.¹⁹ Therefore, the full participation rate is simply the percentage of non-blank ballots. Consequently, the full voter participation rate for the non-RCV 2018 Maine Gubernatorial race

¹⁹ Here I am setting aside the issue that a primary election typically precedes a plurality election so that one might define full participation as casting a ballot in both the primary and general election. But I have also set aside that the Maine RCV general elections are preceded by a primary election.

was 97.3%, while the full voter participation rates for contested state senate elections that year ranged from 95.5% to 98.2% with an average of 97.3%. That is, in contrast to the 2nd CD election, the average rate of fully participating ballots in the 2018 Maine plurality elections was 97.3%

The comparison to runoff elections is not much better. In a traditional majority runoff election, multiple candidates compete in round 1 and then the top two candidates compete in a runoff election held at a later date. Such elections are held in various locations in the U.S. (especially in the southern states) and is the system France uses to elect its president.

As an initial matter, one concern about majority runoffs is that turnout in the second round may fall. This has often been the case when majority runoffs have been used in U.S. primary elections, but in many cases the drop has been less than the number of exhausted ballots typically found in an RCV election. As explained above, the average rate of exhausted ballots in 98 RCV elections that proceeded past the first round of voting is 10.8% of the votes cast.

To take a closer look at this issue, I examined data from U.S. Gubernatorial and Senate primary runoff elections in the United States from 1990 to 2018.²⁰ The unbracketed numbers of Table 4 report the percentage of those elections where the turnout dropoff was less than 10.8%, which is the average rate of ballot exhaustion in the 98 RCV elections I reviewed.

Table 4: Dropoff Rates in Plurality Runoff Elections		
	Percentage with Dropoff less than 10.8%	Percentage with Turnout Increase
Governors	34.8% {42.9%}	4.3% {7.4%}
Senate	6.7% {12.5%}	6.7% {12.5%}

There are many reasons for low voter participation in a runoff primary election, so the fact that so many runoff elections experienced lower dropoff than 10.8% (the equivalent of a “dropoff” in RCV elections following the first round of voting), and certain runoff elections even had *increased* participation is remarkable.

One of the major reasons for lower participation in the runoff is many of the primaries involve nominating candidates who are very likely to lose the general election. A lack of enthusiasm to turn out to choose the “sacrificial lamb” may drive down voter turnout. Accordingly, the bracketed proportion in Table 4 shows the numbers for the primaries where the winner went on to be victorious in the general election. As the table shows, big dropoffs in voter turnout are much less likely in those elections.

A second issue with majority runoff primary elections is that the second round typically occurs on an irregular date and involves a single election race (rather than multiple races like a first-round primary or general election). There are, however, many majority runoff elections where

²⁰ These exclude those from Louisiana for reasons discussed below.

the second round occurs on the Federal Election Day, which experience a boost in voter turnout due to the alignment of the runoff election with other matters of voter interest. These include the Louisiana “jungle” primary system and the “Top 2” primary systems used in California and Washington State.²¹ For Louisiana every single gubernatorial runoff from 1990 to 2019 had a *boost* in turnout, including a 12% increase in voter turnout in 2019. In Louisiana, one of the three Senate runoffs had a voter turnout increase of 38%, one had a decline of less than 1%, while the other had 13% drop. In the latest California and Washington State Congressional elections, *every single race* had higher participation in the second round than in the first. In California, the average turnout increase was 92.5%, while the lowest voter turnout increase was 53.2%. In Washington, district level turnout increased at least 58% in every district, with an average increase of 78%. Clearly, these elections performed much better than RCV in producing majority winners and having good second-round voter participation.

While majority runoff elections compare favorably to RCV elections with respect to participation in the final round, the comparisons in terms of fully participating ballots are not even close. In a majority runoff, full participation requires casting a ballot in both rounds of the election. Unfortunately, with the available aggregate data, we cannot directly observe whether an individual voter voted in each round. But if we assume that a voter who participates in the low turnout round is likely to participate in the high turnout round, then we can estimate the full participation rates for the majority runoff elections discussed in this section. The estimate is simply the ratio of the turnout from the low turnout round to that of the high turnout round. So for most of the primaries, the full participation rate will be runoff turnout divided by first round turnout. For the “top 2” primaries, it will be primary turnout (the low turnout election) divided by general election turnout (the high turnout election).

Table 5 reports statistics on the full participation rates for various types of the majority runoff elections as well as the plurality Maine state senate elections. One can clearly see that the Maine RCV elections have full participation rates far below the averages for the other type of elections. Indeed, the full participation rates for Maine RCV elections come out near the bottom of the 126 elections reflected in the table.²² Only one election scores clearly lower than the 2018 Maine Gubernatorial primary: the 2006 Mississippi Democratic Senate primary, where the winner ultimately lost the general election by almost 30 points.

²¹ In the “Top 2” primary system, all candidates from all parties as well as independents appear on the primary ballot. Each voter casts one vote in the primary, and the two leading vote getters move to the general election. The “jungle” primary differs in that there is no second round if a candidate wins a majority of the vote in the primary.

²² One potential objection to the analysis reported in Table 5 is the assumption that all voters who voted in the low turnout round vote in the higher turnout round. That assumption could be easily relaxed. If I assume that proportion p of the low round voters also voted in the high round, the full participation rate for the majority runoffs would be p times the reported value in Table 5. Therefore, so long as $p > .64$, the RCV elections will still fall below the averages of all of the other types of elections. But p is certainly much larger than that. Based on the 2018 Cooperative Congressional Election Survey, 93% of the respondents who reported voting in a primary had already voted or “definitely” intended to vote in the general election.

Table 5: Full Participation Rates Across Election Types				
	Number	Min	Max	Average
Maine State Senate	33	96%	98%	97%
Governors Primaries	23	42%	98%	81%
Senate Primaries	30	29%	89%	62%
Louisiana Jungle	8	72%	99%	91%
California Top 2 ²³	53	32%	53%	65%
Washington Top 2	10	53%	63%	56%
Maine 2nd CD Election				38%
Maine Congressional Primary				47%
Maine Gubernatorial Primary				35%
Maine 2020 Congressional Primary				59%

In summary, the evidence of this section shows that RCV compares quite unfavorably to majority runoff voting in terms of voter participation and exhaustion. Contrary to the advocacy, the falloff in participation for non-RCV elections is often less than the 10.8% average of ballots that are exhausted in RCV elections. And RCV voters are much less likely to fully participate by ensuring that their ballot will count at all stages of tabulation.

The reasons for this discrepancy are clear. Voters in RCV elections cast ballots in a state of great uncertainty as to which candidate comparisons will be used in later rounds of voting. This leads RCV voters to undervote, leaving their ballots open to the risk of exhaustion in later rounds of voting. On the other hand, majority runoff voters know with certainty which candidates are competing in the runoff. Of course, such voters may choose not to participate in the runoff, but that reflects a much more deliberate choice than the RCV voter who cannot predict the necessity of ranking a certain candidate.

D. Who Truncates Their Ballot and Risks Exhaustion?

Another crucial question for evaluating RCV's propensity to disenfranchise voters by preventing full participation is whether undervoting is a deliberate choice of voters or a reflection of voter

²³ Comparisons of full participation in IRV and Top 2 elections are not exact as the turnout in the decisive round of voting always increases for the Top 2 elections.

confusion related to the complexity of the ballot, the procedures for tabulation, and other characteristics that are inherent to RCV elections.

As noted above, there is no strategic reason for an undervote. We can get some purchase on why a voter would decide to undervote, even if there is no strategic reasons, by identifying what sorts of voters cast less than fully participating ballots that could result in exhausted ballots. Ideally, we would have demographic and other data on each voter that we could match to her ballot. However, ballot secrecy precludes that. So as a second best, I aggregate voting data up to the town level and match it with the demographic data of the town's voters, which I obtained from the 2018 Maine voter file.²⁴

I focus here on two characteristics that are strongly correlated with RCV undervoting—age and education—as other literature demonstrates that older and less-educated voters tend to undervote in RCV elections or have difficulty understanding the ballot.²⁵ Figure 5 shows the relationship between ballot exhaustion and the percentage of voters over 65 for 263 towns in the 2nd CD election that cast at least 200 votes.²⁶ In Figure 5, the area of the circle is proportional to the population of the town. The best fit line weighs larger towns more heavily than smaller towns.²⁷

²⁴ I have not been able to acquire the 2020 Maine voter file so I have not analyzed the effects of education and age on truncation or exhaustion rates in relation to the 2020 Congressional primary.

²⁵ André Blais, Maxime Héroux-Legault, Laura Stephenson, William Cross, and Elisabeth Gidengil, “Assessing the Psychological and Mechanical Impact of Electoral Rules: A Quasi-Experiment,” 31 *Electoral Studies* 829–37 (2012); Francis Neely, Corey Cook, and Lisel Blash, “An Assessment of Ranked-Choice Voting in the San Francisco 2004 Election Final Report May 2005,” Public Research Institute, San. Fran. State Univ. (2006), http://archive.fairvote.org/sfrcv/SFSU-PRI_RCV_final_report_June_30.pdf; Jason McDaniel, “Writing the Rules to Rank the Candidates: Examining the Impact of Instant-Runoff Voting on Racial Group Turnout in San Francisco Mayoral Elections,” 38 *Journal of Urban Affairs* 387–408 (2016); Todd Donovan, Caroline Tolbert, and Kellen Gracey, “Self-Reported Understanding of Ranked-Choice Voting,” 78 *Social Science Quarterly* 973–79 (2019).

²⁶ The criterion that a town cast 200 votes is designed to ensure that we have less noisy estimates of the undervoting rate and of the demographic composition of the voters. None of the conclusions would be altered if the threshold were dropped to 50 votes.

²⁷ Larger towns provide more information about the behavior of individual voters and less random variation. Thus, it is generally considered a best practice to weigh observations based on population.

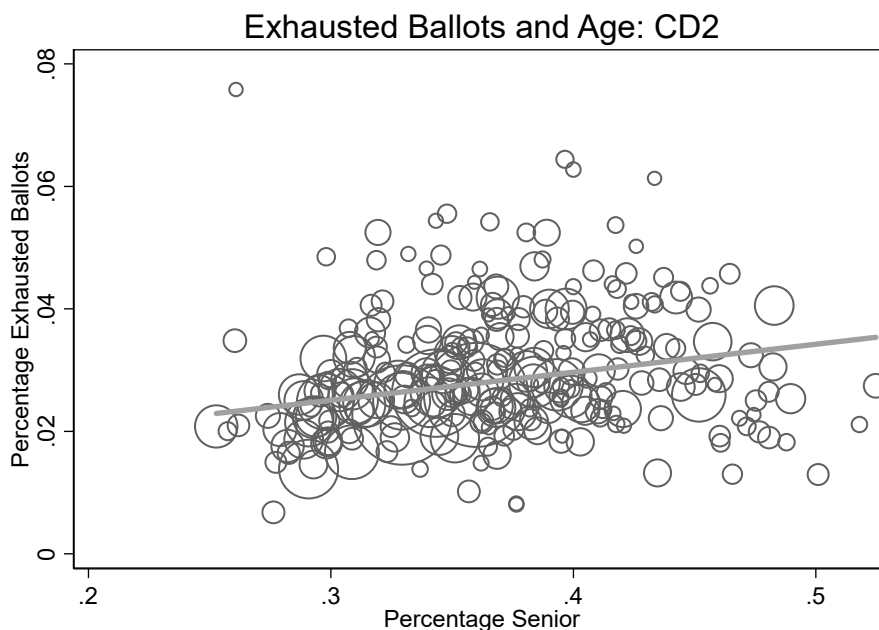


Figure 5: Exhausted Ballots and Age

Figure 5 demonstrates that there is a substantial empirical relationship between the proportion of exhausted ballots and the percentage of elderly voters on the town's voter roll. The expected difference between the town with the lowest proportion of seniors to the one with the most corresponds to a 1.2 percentage point increase in ballot exhaustion.

Figure 6 shows the relationship between exhausted ballots and the percentage of voters without a college degree. As above, the area of the circle identified in Figure 6 is proportional to the population of the town, and the best fit line weighs larger towns more heavily than smaller towns.

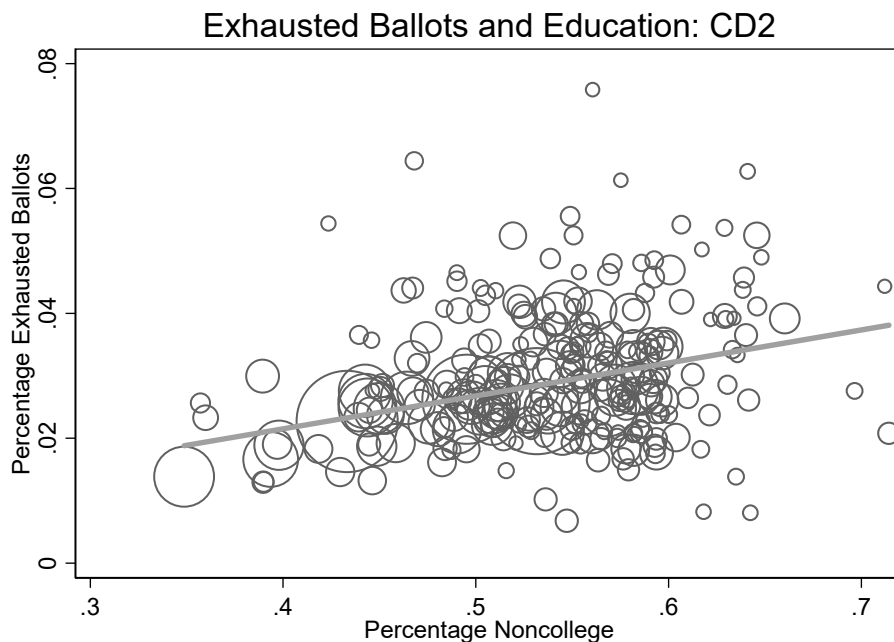


Figure 6: Exhausted Ballots and Education

Here too we find a strong empirical relationship. In expectation, the least-educated town produces 1.9 percentage points more exhausted ballots than the most-educated town.

The relationships between voter age and voter education and undervotes is even stronger if we look at the percentages of truncated ballots (Figures 7 and 8).

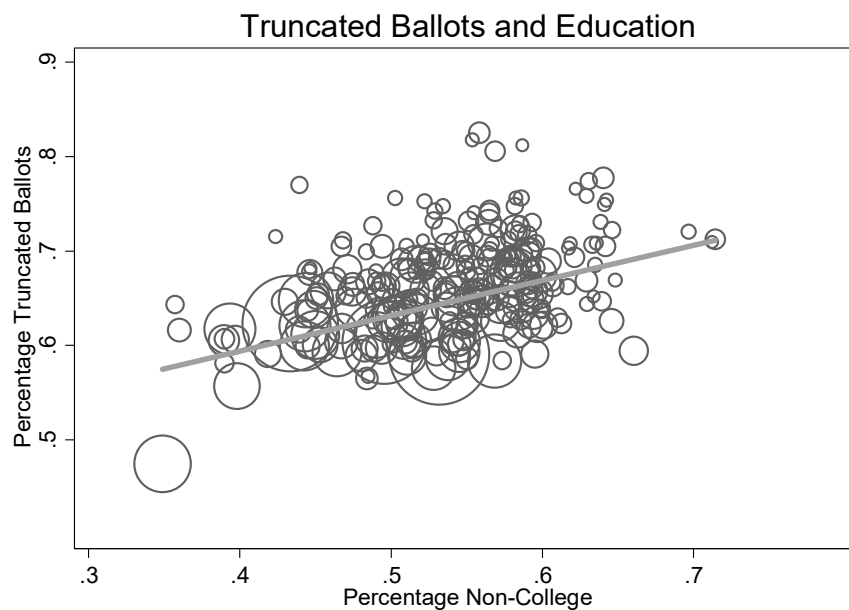


Figure 7: Truncated Ballots and Education

Figure 7, which shows the bivariate relations between education and ballot truncation, shows that in the least-educated town truncates ballots at a 14 percentage point greater rate than the most-educated town.

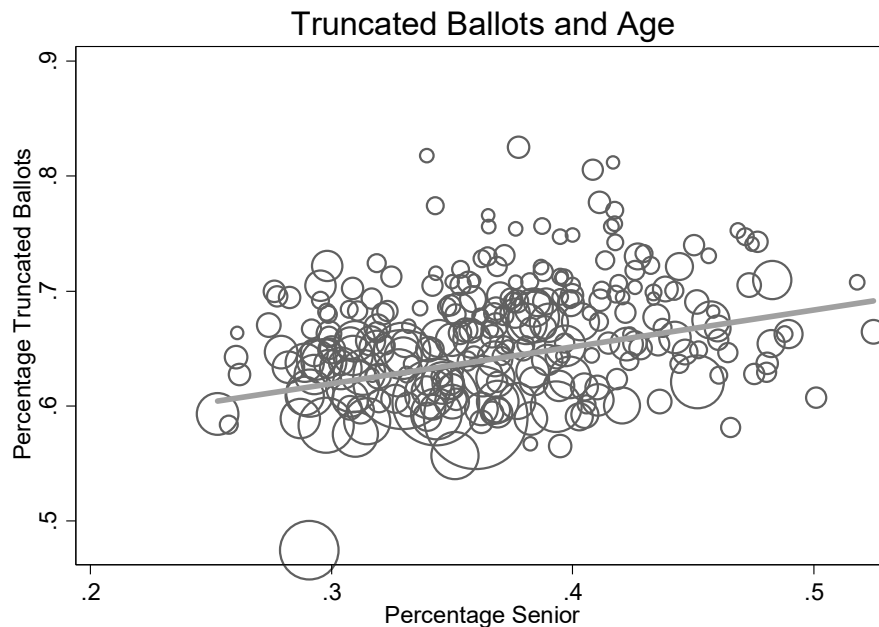


Figure 8: Truncated Ballots and Age

Figure 8, which shows the bivariate relations between age and ballot truncation, shows that the town with the most senior voters truncates ballots at an almost 9 percentage greater rate than the town with the least senior voters. To examine these relationships further, I conduct a multivariate regression analysis of exhausted ballots as well as truncated ballots and total undervoting, including skipping the election entirely. I also control for the percentage of a town's voters that have no party affiliation since they are more likely to have supported one of the independent candidates leading to exhausted ballots. The results are reported in Table 6.

Table 6: Maine Second Congressional District General Election 2018			
	% Truncated Ballots	% Exhausted	All Undervotes
% Non-College	0.364***	0.042***	0.073***
	(0.061)	(0.006)	(0.013)
% Over 65	0.291***	0.054***	0.091***
	(0.077)	(0.011)	(0.022)
% Unaffiliated voters	-0.016	0.043**	0.055*
	(0.085)	(0.014)	(0.030)
Intercept	0.351***	-0.026***	-0.038***
	(0.036)	(0.006)	(0.009)
N	263	263	263

R Squared	0.335	0.277	0.220
Standard errors clustered by county in parentheses			

Note that older and less-educated towns show higher levels of truncated and exhausted ballots as well as total undervotes. To make these results more concrete, I will focus on the impact of increasing the percentage of seniors and non-college voters by 10 percentage points. A 10 percentage point increase in seniors increases truncated ballots by 2.9 percentage points, exhausted ballots by .5 percentage points, and all undervoting by .9 percentage points. Similarly, a 10 percentage point increase in the non-college population increases truncation by 3.6 percentage points, exhausted ballots by .4 percentage points, and all undervoting by .7 percentage points.

The presence of unaffiliated voters is associated only with higher levels of exhausted ballots, but not with truncation or total undervoting.

The analysis can be replicated for the 2018 Gubernatorial primary. But because the primary was open only to Democratic voters, I use the percentage of Democratic voters who are over 65 or lack a college degree. I also conducted separate analyses for all truncated ballots and for those voters who ranked fewer than 4 candidates. These results are reported in Table 7.

Table 7: Maine Democratic Gubernatorial Primary 2018				
	% Truncated	% Fewer than 4	Exhausted Votes	All Undervotes
% Non-College	-0.246***	0.240***	0.125***	0.238***
	(0.067)	(0.088)	(0.043)	(0.032)
% Over 65	0.223***	0.296***	-0.013	0.063
	(0.042)	(0.051)	(0.078)	(0.080)
Intercept	0.678***	0.282***	0.015	-0.023
	(0.035)	(0.040)	(0.043)	(0.038)
N	157	157	157	157
R Squared	0.260	0.272	0.067	0.187
Standard errors clustered by county in parentheses				

These results also show the correlation between voter age, education, and undervoting. Towns with high numbers of non-college Democratic voters tend to have fewer ballots that rank six candidates, and more that rank fewer than four candidates. Those towns have more exhausted votes and higher rates of total undervoting. A 10 percentage point increase in the proportion of non-college voters increases the rate of exhausted votes by 1.3 percentage points and total undervoting by 2.4 percentage points.

Towns where Democratic voters skew older also have more truncated ballots and more ballots ranking fewer than four candidates. A ten percentage point increase in seniors leads to a 2.2 percentage point increase in the number of truncated ballots and a 3 percentage point increase in the number of ballots failing to rank at least four candidates.

Similarly, the analysis can be replicated for the 2018 Congressional primary as reported in Table 8.²⁸ These results are very consistent with those for the general elections in that there are positive correlations between the percentage of non-college and senior voters. But because the sample is much noisier due to lower turnout in the primary, some of the coefficients do not reach statistical significance.

Table 8: Maine Second Congressional District Democratic Primary 2018			
	% Truncated Ballots	% Exhausted	All Undervotes
% Non-College	0.274***	0.032	0.360***
	(0.086)	(0.053)	(0.068)
% Over 65	0.142***	0.053*	0.089
	(0.041)	(0.040)	(0.057)
Intercept	0.344***	-0.009	-0.071
	(0.033)	(0.025)	(0.042)
N	214	214	214
R Squared	0.131	0.045	0.262
Standard errors clustered by county in parentheses			

The analysis from the primary election data, however, should not be compared directly to that of general elections due to the nature of primaries and the individuals who choose to vote in them. On the whole, primary voters tend to be much more interested and engaged in politics, than general election voters.²⁹ So it is remarkable that even among the most politically engaged segments of the electorate, we are seeing high levels of vote truncation and exhaustion and that it is correlated with the age and education profiles of the town. Moreover, in primary elections, there are no partisan reasons for truncation (e.g. a Republican who does not want to rank a Democrat) as all candidates are in the same party.

So, in my view, the fact that even primary voters register high levels of undervoting that is correlated with voter age and education, is further proof of the dangers inherent in RCV elections.

II. LOW FULL-PARTICIPATION RATES IN MAINE CANNOT BE EXPLAINED BY VOTER CHOICE OR EXPRESSION

The numbers detailed above demonstrate that RCV elections suffer from fatal internal flaws. Not only do the high numbers of exhausted ballots fail to decrease over time, those risks significantly *increase* for voters over the age of 65 and for voters who did not graduate from

²⁸ Because primary turnout is lower, I included all towns that had 75 votes or more.

²⁹ See John Sides, Chris Tausanovitch, Lynn Vavreck, and Christopher Warshaw, “On the representativeness of primary electorates,” 50 *British Journal of Political Science* 677–85 (2020).

college. This is particularly troubling in Maine where approximately 60% of Maine's population is over the age of 45—with approximately 23% at age 65 or older—and less than 30% of the population completed a college degree.³⁰

One possible objection to a focus on full participation is that voters might reasonably choose not to rank candidates that they deem unlikely to advance beyond the first round of tabulation. Thus, the argument goes, exhaustion and truncation is merely a product of voter *expression* rather than voter confusion. But, it is unlikely that most voters can make such election-advancement forecasts with any certainty. Indeed, even voting for a major-party candidate in a partisan RCV election is not sufficient to ensure that a voter's ballot is not exhausted. For example, had Independent candidate Angus King failed to obtain a majority in the 2018 Maine Senate election, any voter who ranked only the Democratic candidate would have exhausted her ballot. Moreover, as demonstrated above, the full participation rate in Maine's RCV elections was substantially lower than in traditional plurality and runoff elections, and demographic data demonstrates a strong correlation between ballot exhaustion and truncation (*i.e.*, failure to fully participate) and voter age and education.

Examining the data, it becomes clear that the complexity of the RCV system leads to voter confusion, which prevents voters from fully participating.

III. THE PURPORTED BENEFITS OF RCV ARE NON-EXISTENT

A. Effects on Smaller Parties

One purported benefit of RCV is that it helps smaller parties. Australia provides an excellent test of the extent to which RCV can increase the likelihood that small parties can win legislative elections. Since the early 1900s, Australia has used RCV with single member districts for its lower chamber of parliament. Those elections have traditionally been dominated by two blocs—the Labor Party and a coalition of center-right parties—the Liberal and National parties and some affiliated state parties. The coalition generally avoids running candidates against each other in lower house elections. But the upper house is elected using a ranked-choice system for large multimember districts. This multimember system does allow for the election of many small party legislators. This fact helps us to clearly identify the effects of RCV on small party representation as there is an ample “supply” of small parties that could win seats if the electoral system permitted it. So consider the 2019 elections. In that election only 6 of 151 seats were won by candidates outside the major party blocs. In the Senate, the proportion of smaller party winners was only five times as large (14 of 76 seats). This suggests that the single-member RCV system such as that used in Maine penalized those smaller parties that were viable for Senate seats. These low numbers for small party representation fall far short of the riches promised.

Of course, one might argue that the lower house outcomes compare favorably to those under a plurality voting system. Indeed, those numbers are better than the U.S. where only two independent serve in the Senate (Angus King and Bernie Sanders) and the House's only independent (Justin Amash) was elected as a Republican. But there are many legislatures world-

³⁰ *Electorate Profile: Maine*, U.S. Census Bureau (Feb. 29, 2016), https://www.census.gov/library/visualizations/2016/comm/electorate-profiles/cb16-tps34_voting_maine.html.

wide where small parties have achieved substantial representation under simple plurality rule. For example, in the British parliament, 75 out of 650 seats are held by parties other than Labor and the Conservatives.³¹ In Canada, smaller parties and independents won 61 out of 338 seats.³²

In summary, after reviewing the outcomes in the democracies most similar to the U.S., it does not seem that RCV is either a sufficient or necessary condition for the success of small parties.

B. Effects on Turnout and Engagement

Advocates of RCV also argue that the system is likely to encourage greater participation among voters for two reasons. First, the RCV system purportedly encourages more candidates to run for office, providing a wider variety of choices to voters. Second, advocates contend that RCV will dampen incentives for the sorts of negative campaigning that turns voters away from politics. The argument is that candidates will refrain from attacking opponents if they expect to need high rankings from that opponent's supporters. The critics of RCV, however, argue that the complexity of the ballot and the tabulation procedures have the opposite effect of discouraging electoral participation.

On the question of turnout, the empirical literature supports the critical view that RCV elections discourage voter participation. Jason McDaniel finds that turnout dropped in San Francisco mayoral elections following the adopting of RCV, especially among minority groups.³³ In a study of several RCV cities matched against comparable plurality cities, David Kimball and Joseph Anthony find a 4 percentage point drop in turnout associated with RCV, although the estimate is not statistically significant on its own.³⁴ In a more recent study, McDonald finds a statistically significant five percentage point drop due to the introduction of RCV in municipal elections relative to similar cities that maintain plurality electoral systems. While there is disagreement about the magnitude and statistical reliability of the estimated declines in voter turnout, I am not aware of any study that finds a boost in turnout associated with switching to RCV from plurality voting.

Because the Maine general election ballot includes both races that use RCV and those that use plurality rule, I cannot assess the impact of RCV adoption in Maine using the methodologies of the previously mentioned studies that look at the total number of ballots cast before and after adoption of RCV. So I will look at the issue of *total undervoting* (leaving the ballot blank for a specific race or exhaustion of that ballot) in RCV contests versus that in plurality contests. If RCV generated greater enthusiasm among voters we would expect to see far less total undervoting in RCV elections. A complication, however, is that the RCV ballots were used in the more high profile election where we would naturally expect more voter interest and

³¹ If one were to focus only on England to eliminate the effects of regional parties, smaller parties won 8 out of 533 seats.

³² If one were to ignore Quebec and the effects of Bloc Quebecois, small parties and independents won 29 out of 260 seats.

³³ Jason A. McDaniel, "Writing the Rules to Rank the Candidates: Examining the Impact of Instant-Runoff Voting on Racial Group Turnout in San Francisco Mayoral Elections," 38 *Journal of Urban Affairs* 387–408 (2016).

³⁴ David C. Kimball and Joseph Anthony, "Voter Participation with Ranked Choice Voting in the United States," Presented at the Annual Meeting of the American Political Science Association, Philadelphia, PA (2016).

engagement. Nevertheless, I find that several down-ballot, non-RCV races had lower percentages of total undervotes compared with RCV races.

In 2018, the two most high-profile elections in Maine were the Senate and Governor's race. The Senate election, which utilized an RCV ballot, was skipped by 1.8% of the Election Day voters. The Governor's race (non-RCV) had 2.3% blank ballots. While this may appear as an advantage for RCV, as we will see, the difference between total undervoting for RCV elections and plurality down-ballot races is not substantively different. In the 2nd CD election in Maine, 2.2% of voters failed to register any vote at all, while in the Maine 2018 First Congressional District general election ("1st CD election"), 2.3% skipped voting. Based on data acquired from the Maine Secretary of State website, at least 25% of competitive state senate elections had lower rates of total undervoting, despite the fact that state legislative races tend to be lower profile than congressional elections (See Figure 9 and Table 9), and many of the state senate elections were not as competitive as the Congressional races.

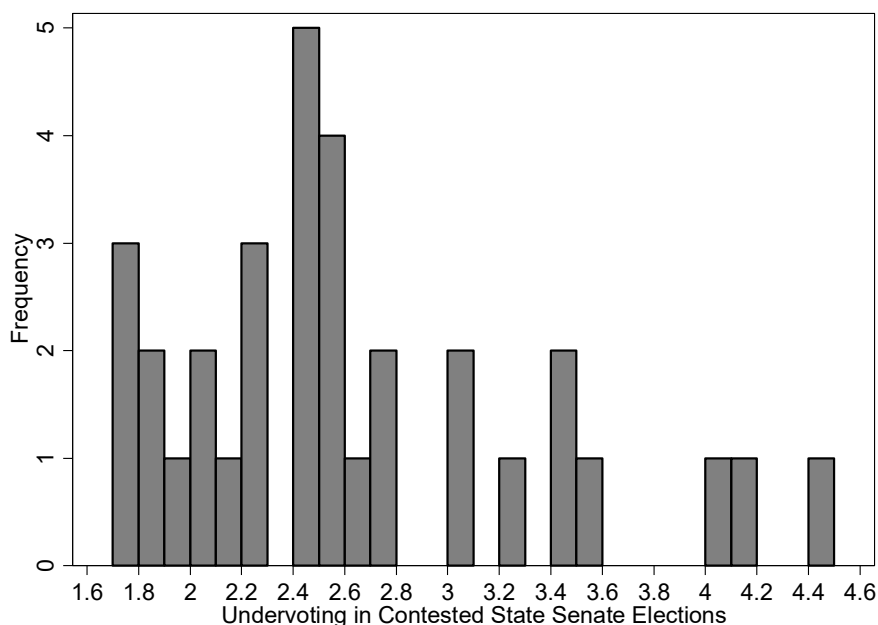


Figure 9: Rates of Total Undervoting in 2018 Contested State Senate Elections

Even in Maine's plurality races that are less popular, less funded, and less advertised, the rate of total undervoting is not significantly different than the rates of total undervoting in the RCV elections.

If I focus on the 14 state senate races with less than a 20-point margin, the performance in the Congressional races looks even less impressive. (See Figure 10)

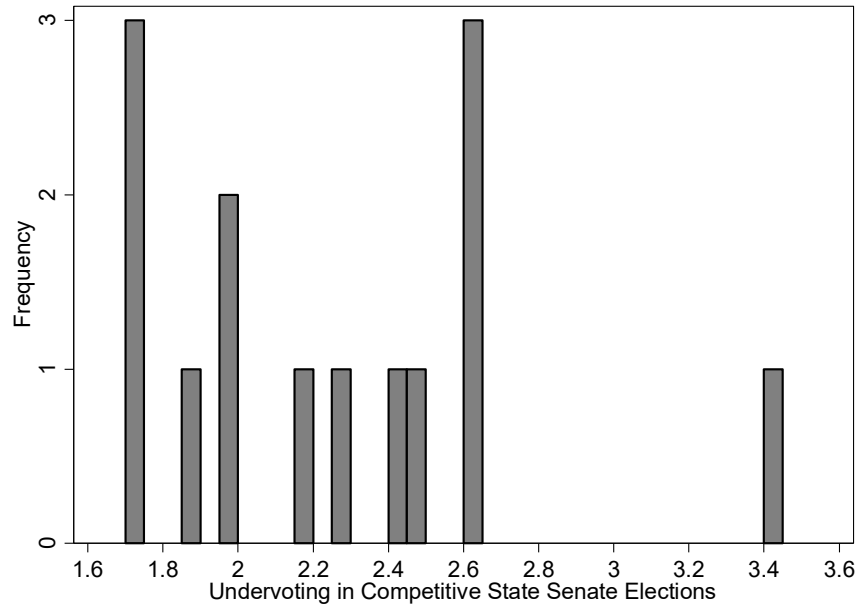


Figure 10: Total Undervoting in 2018 Competitive State Senate Elections

In Figure 10, approximately eight of the fourteen most-contested state senate races in Maine, which were on the ballot at the same time as the hotly contested and well-publicized RCV elections, had lower rates of total undervoting.

Table 9: Comparison of Total Undervoting in 2018 RCV Elections and State Senate Elections

Election	% Blank Ballots	% of Contested State Senate Districts with lower total undervoting	% of Competitive State Senate Districts with lower total undervoting
Senate	1.80%	9%	21%
Governor	2.38%	36%	64%
1st CD election	2.26%	27%	50%
2nd CD election	2.18%	24%	43%

This phenomenon was demonstrated again in the 2020 Congressional primary. A notable feature of the 2020 Congressional primary was the very large number of voters who skipped the race entirely. Even though the election was the highest profile contested primary,³⁵ 4,271 or 9.1% failed to cast a vote.

³⁵ Senator Susan Collins was unopposed in the 2020 Republican Senate primary.

In summary, the rates of total undervoting in the RCV elections does not appear to be substantively different than those of the lower-profile plurality state senate elections. Accordingly, there is little empirical evidence that Maine voters are more interested and engaged under the RCV system.

C. The Spoiler Effect

Another major argument in favor of RCV is that it purports to eliminate the possibility of a third-party spoiler who throws the election to the candidate who is less preferred by a majority of voters. To illustrate suppose there are three candidates A, B, and C, and a majority of the voters prefer A to B. Despite the fact that a majority prefers A, A might lose if enough voters vote for C in the first round to give B a plurality. RCV, however, purports to solve this problem by eliminating the least popular candidate in round 1 (in this case C) and transferring that candidate's votes to the voters' second-choice candidates. Since A is preferred by a majority to B, A should win.

But RCV creates a different type of spoiler effect. Again suppose there are three candidates: A, B, and C. Moreover, assume that A would beat C in a candidate election but B would beat A. Thus, whether A wins the election depends on whether she faces B or C. To see how this generates a possible spoiler effect under RCV, suppose that $\#A > \#B > \#C$ in the first round (where $\#A$ is the number of votes received by candidate A). Subsequently, C would be eliminated and B would beat A in the second round. But were this the case, some of A's supporters could improve A's chances of winning by voting for C in the first round to help ensure a more favorable second round. Party A would want to transfer enough support to move C into the second position, but not so much that A falls out of the first position. Such a transfer of support is feasible only if $\#A + \#C > \#B$.

Voting theorists generally refer to this scenario as reflecting the *non-monotonicity* of the RCV system. The terminology reflects the fact that increasing the votes for a particular candidate can make that candidate more likely to lose. This outcome would be the case in the example above if $\#A > \#C > \#B$ initially but enough C voters switched to A to allow B into the second round. Logically, *non-monotonicity* also implies that a party can increase its likelihood of winning by *losing* votes, as in the original example where A does better by shedding votes to C. The non-monotonicity criticism of RCV usually focuses on abstract and hard-to-measure concepts like "voter welfare." But it has more tangible and observable implications as well. Note the many ways in which one of the parties/candidates in the above example can manipulate the outcome of an election due to this principle:

1. Candidate A could ask some of her supporters to vote C in round 1;
2. Candidate A could provide financial and other resources to candidate C;
3. Candidate A could run attack ads on B designed to appeal to C voters;
4. Candidate A could recruit candidate C to run; and
5. Candidate B could bribe candidate C not to run.

Thus, non-monotonicity opens up a number of possible avenues for electoral manipulation. It is an empirical question, however, as to how prevalent the RCV spoiler effect is relative to the plurality spoiler effect. A direct assessment is difficult in that it requires data on voters' true preferences and their ranked-choice ballots. While data on full ranked-choice ballots is available for a handful of RCV elections, data on voters' true preferences are generally not available.

For this reason, scholars often use simulated elections to predict the frequency in which RCV elections demonstrate non-monotonic outcomes. One such effort is that of Joseph Ornstein and Robert Norman (2014), who calculate a lower bound estimate that 15% of competitive RCV elections result in monotonicity failures.³⁶

Despite the fact that direct empirical verification of non-monotonicity is difficult to obtain, real world data can be used to identify elections where non-monotonicity was at least possible. Recall that a necessary condition for non-monotonicity in a three-candidate election is that $\#A + \#C > \#B$. Using the dataset on 98 RCV elections described above, I am able to verify whether this condition held for 93 of those contests.³⁷ I found that the necessary condition held in 27 of these elections (29%). That is, in 29% of the RCV elections that progressed beyond the first round, the spoiler effect described above ($\#A + \#C > \#B$) was demonstrated. Thus, the opportunities for the electoral manipulations described above are far from rare.

D. Non-Majority Winners

Another important claim of RCV advocates is that the system purportedly ensures that the winner obtains a majority of the votes cast. This claim is incorrect empirically as ballot exhaustion means that the number of valid ballots used to determine the winner is actually far less than the number of votes cast. This fact was demonstrated in Maine's first RCV general election in 2018 when Jared Golden beat Bruce Poliquin in the 2nd CD election with only 49.2 percent of the ballots cast.

Using the data on 98 RCV elections nationwide, I can compute the percentage of times that the winner failed to obtain a majority of the ballots cast. Such was the outcome in over 60% of those elections (60 of 98). Non-majority winners occur almost 80% of the time in those RCV elections with five or more candidates. Thus, RCV cannot be trusted to ensure that the candidate with majority support wins an election, and it generally fails to accomplish one of the key tasks it was designed to perform.

CONCLUSION

Despite the growing interest in electoral reforms that replace plurality and majority runoff elections with RCV, the evidence of its costs is substantial—particularly in Maine—and there is scarcely any empirical evidence that any of the purported benefits have come to fruition.

³⁶ Joseph T. Ornstein and Robert Z. Norman, "Frequency of Monotonicity Failure under Instant Runoff Voting: Estimates Based on a Spatial Model of Elections," 161 *Public Choice* 1–9 (2014).

³⁷ For elections with more than three candidates, I examined whether the condition held in the round where there were only three candidates remaining. It is of course possible that the conditions for non-monotonicity held at earlier rounds, so my estimate is conservative.

Representative democracy is a balancing act. At one end is the concern that the electoral machinery should provide voters with an ample set of choices as to who will govern in their name. But on the other end is the concern that voting procedures not be so complex, confusing, and opaque as to deprive voters of the ability to exercise those choices in an informed and meaningful way. That is exactly what is happening with RCV, and what occurred in Maine in 2018. While RCV aspires to expand voter choice, the empirical evidence that it has done so is nearly non-existent, and is clearly not enough to balance its substantial burden on meaningful and informed choice.

A handwritten signature in black ink, reading "Nolan McCarty". The signature is fluid and cursive, with the first name "Nolan" and last name "McCarty" clearly distinguishable.

Professor Nolan McCarty

Date: 7/27/2020

Appendix A:

Nolan McCarty

Department of Politics and School of Public and International Affairs
Princeton University
Princeton, NJ 08544
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Academic Affiliations

Susan Dod Brown Professor of Politics and Public Affairs, Princeton University, 2007-present.

Research associate, National Bureau of Economic Research, 2012 – present. (Research fellow, 2006-2012).

Professor of Politics and Public Affairs, Princeton University, 2003 – 2007.

Fellow, Center for the Advanced Study in the Behavioral Sciences, 2004-2005.

Associate professor of Politics and Public Affairs (with tenure), Princeton University, 2001-2003.

Associate professor of Political Science (with tenure), Columbia University, 2000-2001.

Robert Eckles Swain National Fellow, Hoover Institution, Stanford University 1999-2000.

Assistant professor of Political Science, Columbia University, 1996-2000.

Assistant professor, School of Business Administration, University of Southern California, 1993-1996.

Instructor, Graduate School of Industrial Administration, Carnegie Mellon University, 1993.

Administrative Positions and University Service

Director, Data Intensive Social Science Initiative (2019 - current)

Chair, Student Appeal Panel (2019-2020)

Chair, Department of Politics (2011 - 2018)

Associate Dean, School of Public and International Affairs (2005-2011).

Acting Dean, School of Public and International Affairs (2007-2008).

Member, Council for the Princeton University Community Executive Committee (2015-2018)

Member, Princeton University Faculty Committee on Policy, (2015-2016)

Executive committee, Julis-Rabinowitz Center for Finance and Public Policy (2011 – 2015)

Executive committee, Center for the Study of Democratic Politics (2003 – 2019)

Elected member, Princeton University Committee on Appointments and Advancements (C/3) 2009-2010.

Co-Chair, School of Public and International Affairs Undergraduate Curriculum Reform (2010-2011).

Chair, Resources Committee, Council of the Princeton University Community (2007 - 2008).

Faculty Chair, PhD Program, School of Public and International Affairs, 2002-2004.

Director, Graduate Program in Political Economy, 2001-2004.

Member, Task Force on the Changing Nature of Government Service (chaired by Paul Volcker and Anne-Marie Slaughter)

Berman Prize in the Humanities selection committee

Honors, Awards, and Grants

2016 Franklin L. Burdette/Pi Sigma Alpha Award for best paper presented at American Political Science Association meetings.

Best Paper Award, APSA Legislative Politics Section (2016)

Distinguished Visiting Scholar, Political Economy Group, Stanford Graduate School of Business (2016)

Best Paper Award, APSA State and Local Politics Section (2015)

Fellow, School of Social Sciences, Institute for Advanced Study (2014-2015).

University of Chicago Harris School, Visiting Fellow in Policy Entrepreneurship (2013)

Princeton University President's Lecture Series, 2010.

Member, American Academy of Arts and Sciences (elected 2010)

Fellow, Center for the Advanced Study in the Behavioral Sciences, 2004-2005.

Robert Eckles Swain National Fellow, Hoover Institution 1999-2000.

Patrick J. Fett Award for the best paper on the scientific study of Congress and the Presidency at the 1998 Midwest Political Science Association Meetings.

John M. Olin Fellowship in Political Economy (1990-1993)

Phi Beta Kappa (1990)

Council for Humanities and Social Sciences, Columbia University, 1996-97 (\$6,000)
National Science Foundation Grant, 1995-96 (\$87,500)
Institute for Social and Economic Theory and Research, Columbia University (\$10,000)
Russell Sage Foundation “Polarization, Inequality, and Public Policy in the American States,” 2002-2003 (\$97,000)
National Science Foundation “The Ideological Mapping of American Legislatures” (\$300,000)
Russell Sage Foundation “The Political Economy of the State Pension Crisis” (\$111,000)
John and Laura Arnold Foundation “Polarization, Partisanship and Electoral Reform in the American States” (\$154,000)

Education

Ph.D. Political Economy. Carnegie Mellon University, Pittsburgh, PA. 1993.
M.S. Political Economy. Carnegie Mellon University, Pittsburgh, PA. 1992.
A.B. Economics with Honors. University of Chicago, Chicago, IL. 1990.

Books

Political Bubbles: Financial Crises and the Failure of American Democracy (with Keith Poole and Howard Rosenthal). 2013. Princeton University Press.

Reviews: *The New Republic*

Political Game Theory (with Adam Meirowitz). 2006. Cambridge University Press.

Polarized America: The Dance of Political Ideology and Unequal Riches (with Keith T. Poole and Howard Rosenthal). Second edition. 2016. MIT Press.

First edition, 2006.

Named an “Outstanding Academic Title” by *Choice* in 2007.

Critics Roundtables: 2005 APSA, 2006 MPSA

Reviews: *American Prospect*, *Perspectives on Politics*, *Chicago Tribune*, *American Review of Politics*, *Economic History Net*, *Independent Review*, *The Week*, *Journal of Economic Issues*, *Journal of Sociology and Social Welfare*, *The Independent Review*, *Political Science Quarterly*

Can America Govern Itself? Co-edited with France Lee. 2019. Cambridge University Press.

Polarization: What Everyone Needs to Know. 2019. Oxford University Press.

Other Monographs

The Realignment of National Politics and the Income Distribution (with Keith T. Poole and Howard Rosenthal). 1997. American Enterprise Institute Studies on Understanding Economic Inequality.

Journal Articles

- [22] “Geography, Uncertainty, and Polarization” (with Jonathan Rodden Boris Shor, Chris Tausanovitch, and Chris Warshaw) 2018. *Political Science Research and Methods*
- [21] “Regulation and Self-Regulation of a Complex Industry.” 2017. *Journal of Politics* 79(4):1220-1235.
- [20] “A Primary Cause of Partisanship? Nomination Systems and Legislator Ideology” (with Eric McGhee, Seth Masket, Boris Shor, and Steven Rogers). 2014. *American Journal of Political Science* 58(2):337-351. (co-winner of the 2015 State Politics and Policy Best Journal Article Award)
- [19] “The Ideological Mapping of American Legislatures” (with Boris Shor). 2011 *American Political Science Review* 105(3):530-551.
- [18] “A Bridge to Somewhere: Mapping State and Congressional Ideology on a Cross-Institutional Common Space” (with Boris Shor and Christopher Berry). 2010. *Legislative Studies Quarterly* 35(3): 417-448.
- [17] “Does Gerrymandering Cause Polarization?” (with Keith Poole and Howard Rosenthal) 2009. *American Journal of Political Science* 53(3):666-680.
- [16] “Presidential Vetoes in the Early Republic: Changing Constitutional Norms or Electoral Reform.” 2009. *Journal of Politics* 71(2): 369-384.
- [15] “Bureaucratic Capacity, Delegation, and Political Reform” (with John Huber). 2004. *American Political Science Review* 98(3): 481-494.
- [14] “The Appointments Dilemma.” 2004. *American Journal of Political Science* 48(3): 413-428.
- [13] “Political Resource Allocation: The Benefits and Costs of Voter Initiatives,” (with John G. Matsusaka). 2001. *Journal of Law, Economics, and Organization*. 17(2): 413-448.
- [12] “The Hunt for Party Discipline” (with Keith Poole and Howard Rosenthal). 2001. *American Political Science Review*. 95(3):673-687.
- [11] “Cabinet Decision Rules and Political Uncertainty in Parliamentary Bargaining” (with John Huber). 2001. *American Political Science Review*. 95(2):345-360.
- [10] “The Politics of Blame: Bargaining before an Audience” (with Timothy Groseclose) 2000. *American Journal of Political Science*. 45(1):100-119.
- [9] “The Time to Give: PAC Motivations and Electoral Timing” (with Lawrence Rothenberg). 2000. *Political Analysis*. 8(3):230-259.

- [8] “Coalitional Maintenance: Politicians, Parties, and Organized Groups” (with Lawrence Rothenberg). 2000. *American Politics Quarterly*, 28(3):291-308.
- [7] “Proposal Rights, Veto Rights, and Political Bargaining.” 2000. *American Journal of Political Science*, 44(3):506-522.
- [6] “Presidential Pork: Executive Veto Power and Distributive Politics.” 2000. *American Political Science Review*, 94(1):117-129.
- [5] “Advice and Consent: Senate Response to Executive Branch Nominations 1885-1996” (with Rose Razaghian). 1999. *American Journal of Political Science*, 43(3):1122-43.
- [4] “An Empirical Spatial Model of Congressional Campaigns” (with Keith T. Poole). 1998. *Political Analysis*, 7(1):1-30.
- [3] “Presidential Reputation and the Veto.” 1997. *Economics and Politics*, 9(1):1-26.
- [2] “Commitment and the Campaign Contribution Contract” (with Lawrence Rothenberg). 1996. *American Journal of Political Science*, 40(3): 872-904.
- [1] “Veto Power and Legislation: An Empirical Analysis of Executive-Legislative Bargaining from 1961-1986” (with Keith T. Poole). 1995. *Journal of Law, Economics, & Organization*, 11(2):282-312.

Book Chapters and Invited Contributions

- [32] “Learning From Each Other: Causal Inference and American Political Development” (with Jeffery A. Jenkins and Charles Stewart) *Public Choice*
- [31] “The Political Obstacles to Tackling Economic Inequality in the United States” In Dani Rodrik and Olivier Blanchard eds. *Combating Inequality*, MIT Press. (forthcoming)
- [30] “Polarization and the Changing American Constitutional System: The Case of Federalism” forthcoming in Eric Patashnik and Wendy Schiller eds. *The Dynamics of American Democracy: Partisan Polarization, Political Competition and Government Performance* University of Kansas.
- [29] “Anxieties of American Democracy,” (with Frances Lee). In Frances Lee and Nolan McCarty *Can America Govern Itself?* Cambridge University Press.
- [28] “Polarization and the Changing Constitutional System.” In Frances Lee and Nolan McCarty *Can America Govern Itself?* Cambridge University Press.
- [27] “Anxieties of American Democracy,” (with Frances Lee). In Frances Lee and Nolan McCarty *Can America Govern Itself?* Cambridge University Press.

- [26] “On the Theory of Parties” (with Eric Schickler). 2018. *Annual Review of Political Science* 21(1):175-193.
- [25] “Pivotal Politics, Political Polarization, and Policy Predictability.” 2018. *Journal of Politics* (Symposium) 80(3)
- [24] “In Defense of DW-NOMINATE.” *Studies in American Political Development*. 2016. 30(2):172-184.
- [23] “Polarization, Congressional Dysfunction, and Constitutional Change.” *Indiana Law Review*. 2016. 50(1): 224-245.
- [22] “Congressional Polarization and Its Connection to Income Inequality: An Update.” (with Adam Bonica, Keith Poole, and Howard Rosenthal). In James Thurber and Antoine Yoshinaka *American Gridlock: The Sources, Character, and Impact of Political Polarization*, 2015 Cambridge University Press.
- [21] “Regular Order in Appropriations: Does It Matter?” in *Congress and Policymaking in the 21st Century* eds. Eric Patashnik and Jeffery Jenkins, 2015 Cambridge University Press.
- [20] “Reducing Polarization: Some Facts for Reformers” *The University of Chicago Legal Forum* 2015: 243-278.
- [19] “Democracy in America, 2014” (with Didi Kuo) *Global Policy Journal* 6(S1):49-55
- [18] “The Causes and Consequences of Polarization” (with Michael Barber) in *Solutions to Polarization in America* eds. Nathaniel Persily. Cambridge University Press, 2015.
- [17] “Reducing Polarization by Making Parties Stronger” in *Solutions to Polarization in America* eds. Nathaniel Persily. Cambridge University Press, 2015.
- [16] “Anxieties about Congress.” *The Democracy Papers* Social Science Research Council <http://thedemocracypapers.ssrc.org/anxieties-about-congress/>
- [15] “Income Inequality and Participation” *The Democracy Papers* Social Science Research Council <http://thedemocracypapers.ssrc.org/income-inequality-and-participation/>
- [14] “The Causes and Consequences of Polarization” (with Michael Barber) in *Political Negotiation a Handbook* eds. Cathie Jo Martin and Jane Mansbridge. Brookings Institution Press, 2015.
- [13] “Why Hasn’t Democracy Slowed Rising Inequality?” (with Adam Bonica, Keith Poole, and Howard Rosenthal). 2013. *Journal of Economic Perspectives*. 27(3): 103-24.

German translation: “Warum Hat die Demokratie den Anstieg der Ungleichheit nicht verlangsamt? In *Berliner Debatte Initial* 2015.
- [12] “Complexity, Capacity, and Capture” in *Preventing Capture* eds. Daniel Carpenter, Steven Croley, and David Moss. Cambridge University Press, 2013.

- [11] “The Political Economy of Immigration Incorporation into the Welfare State” in *Outsiders No More? Models of Immigrant Political Incorporation* eds. Jacqueline Chattopadhyay, Claudine Gay, Jennifer Hochschild, Michael Jones-Correa, Oxford University Press, 2013.
- [10] “Political Fortunes: On Finance and Its Regulation” (with Keith Poole, Thomas Romer, and Howard Rosenthal). 2010. *Daedalus* Fall: 61-73.
- [9] “Measuring Legislative Preferences.” *Oxford Handbook of Congress* eds. Eric Schickler and Frances Lee. 2011.
- [8] “The Politics of the Pop: the U.S. Response to the Financial Crisis and the Great Recession” In *Coping with Crisis: Governmental Responses to the Great Recession* eds. Nancy Bermeo and Jonas Pontusson. 2012.
- [7] “The Political Economy of Inequality and Redistribution” (with Jonas Pontusson). 2009. Brian Nolan, Weimar Salverda, and Tim Smeeding eds. *Handbook of Economic Inequality*. Oxford University Press.
- [6] “The Policy Consequences of Political Polarization.” 2007. Paul Pierson and Theda Skocpol eds. *The Transformation of the American Polity* Princeton University Press.
- [5] “Does Bicameralism Matter?” (with Michael Cutrone). 2006. Donald Wittman and Barry Weingast eds. *Handbook of Political Economy*.
- [4] “Models of Vetoes and Veto Bargaining,” (with Charles Cameron). 2005. *Annual Review of Political Science* 7:409-435.
- [3] “Bureaucratic Capacity and Legislative Output,” (with John Huber). 2006. *The Macropolitics of Congress*. eds. E. Scott Adler and John Lapinski.
- [2] “Hitting the Ground Running: The Timing of Presidential Appointments in Transition,” (with Rose Razaghian) in *Presidential Power: Forging the Presidency for the 21st Century*. eds. Martha Joynt Kumar, Robert Y. Shapiro, and Lawrence R. Jacobs. New York: Columbia University Press.
- [1] “Congress and the Territorial Expansion of the United States” (with Keith Poole and Howard Rosenthal) in *New Directions in Studying the History of the U.S. Congress*. eds. David Brady and Mathew McCubbins. Stanford: Stanford University Press.

Reviews and Comments

- [10] “The Political Roots of Inequality.” *The American Interest*. 2013. Summer (May/June):68-74.
- [9] Review of Cass Sunstein *Going To Extremes: How Like Minds Unite and Divide*. 2011. *Political Science Quarterly*. 126(2):328-329.
- [8] “The Limits of Electoral and Legislative Reform in Addressing Polarization.” 2011. *University of California Law Review* 99:359-372.

- [7] Review of Benjamin Page and Lawrence Jacobs *Class Wars: What Americans Really Think About Economic Inequality*. 2010. *The Forum* 8(2): article 10
- [6] Review of Sean Theriault *Party Polarization in Congress*. 2009. *Political Science Quarterly* 124(3):551-552.
- [5] Review of Barbara Sinclair *Party Wars: Polarization and the Politics of National Policymaking*. 2007. *Political Science Quarterly* 122(1):159-150.
- [4] “Congressional Studies and Political Economy” *The Political Economist* Volume XIII, Issue 3 Fall 2006.
- [3] Comment on Melissa Cully Anderson and Nathaniel Persily “Regulating Democracy Through Democracy: The Use of Direct Legislation in Election Law Reform.” 2005. *University of Southern California Law Review* 78(4):1035-1040.
- [2] Review of Keith L. Dougherty *Collective Action under the Articles of Confederation*, 2002. *Political Science Quarterly* 117(1):173-174.
- [1] Review of Patricia Heidotting Conley *Presidential Mandates: How Elections Shape the National Agenda*. 2001. *Presidential Studies Quarterly*, p. 747-749.

White Papers and Policy Reports

Chair and lead author. “Political System Subcommittee Report” in Stigler Center Committee on Digital Platforms Report, July 2019.

Chair and lead author, Appropriation Reform Subcommittee American Political Science Association Task Force on Congressional Reform.

Opinion Pieces

“Grading the Cromnibus” *Washington Post Monkey Cage Blog* December 12, 2014

“Will Loretta Lynch End Too Big To Jail” *Washington Post Monkey Cage Blog* November 13, 2014

“Five Things the Goldman Tapes Teach Us About Financial Regulation” *Washington Post Monkey Cage Blog* September 30, 2014

“What We Know and Don’t Know about Our Polarized Politics” *Washington Post Monkey Cage Blog* January 8, 2014

“The Politics of Bad Apples” *Washington Post Monkey Cage Blog* October 24, 2013

“Hate Our Polarized Politics? Why You Can’t Blame Gerrymandering.” *Washington Post* October 26, 2012. http://articles.washingtonpost.com/2012-10-26/opinions/35500270_1_polarization-districts-independent-voters

“The Price of Principle” *Huffington Post* July 20, 2010. (with Keith Poole, Thomas Romer, and Howard Rosenthal).

“McCain for President?: A Liberal Conservative Oscillation Cements His Maverick Reputation.” *San Diego Union Tribune* August 31, 2008 (with Keith Poole and Howard Rosenthal)

http://www.signonsandiego.com/uniontrib/20080831/news_lz1e31mccarty.html

“Obama for President?: Moderate and independent voters still must be convinced” *San Diego Union Tribune* August 24, 2008 (with Keith Poole and Howard Rosenthal)

http://www.signonsandiego.com/uniontrib/20080824/news_lz1e24obama.html

“Neither Candidate Likely to Reduce Rancor” *Politico*, July 24, 2008 (with Keith Poole and Howard Rosenthal) <http://www.politico.com/news/stories/0708/12013.html>

Blog: <http://nolanmccarty.com>

Occasional contributor: <http://themonkeycage.org>

Other Work in Progress

“Unequal Incomes, Ideology and Gridlock: How Rising Inequality Increases Political Polarization” with Boris Shor and John Voorhies. (Winner of the 2016 Franklin L. Burdette/Pi Sigma Alpha Award by the American Political Science Association and Best Paper Awards from the APSA Legislative and State and Local Politics sections.)

“Agenda Control Under Uncertainty” (with Steven Callander)

“The Evolution from a Democratic to Republican South” (with Steven Rogers)

“Congressional Dysfunction and Bureaucratic Capacity.” (with Alex Bolton and Sara Kerovsky).

“Polarization and the American Constitution.”

Courses Taught

Doctoral Level

Congressional Politics. Princeton University.

Bureaucratic Politics. Princeton University.

Analysis of American Political Institutions. Princeton University.

Democratic Processes. Columbia University

Political Methodology Sequence. Columbia University

Colloquium on Political Organizations and Interest Groups. Columbia University

Research Controversies in American Politics. Columbia University

Mathematics for Political Science. Columbia University

The Politics of Inequality in the U.S. and Western Europe. Princeton University

Game Theory and Political Theory. Columbia University

Formal Theory I. Princeton University.

Master's Level

Legislative Politics. Princeton University. (Spring 2003)
Advanced Econometrics and Public Policy. (Spring 2003)
Business, Government, and Society. University of Southern California
Business and Its Nonmarket Environment. University of Southern California

Undergraduate

Democracy. Princeton University.
Democracy and Constitutional Engineering. Columbia University Summer Program in
Tunis and Istanbul.
Polarized America: Polarization, Inequality and the Future of American Politics.
Princeton University.
American Politics. Princeton University.
The Development of American Political Institutions. Princeton University.
The Politics of Reform. Columbia University
Decline of the American Party System? Columbia University
Introduction to American Government and Politics. Columbia University
Public Finance. Carnegie Mellon University

Professional Activities

Conference Participation

American Economic Association (2002)
American Political Science Association (various years)
Can Madison's Constitution Survive Polarized Parties?, UC Berkeley (2016)
Challenges in Political Economy, Harvard University (2002)
Comparative Political Economy Workshop, Harvard (2006)
Designing Democratic Institutions, LSE (2008)
Eric M. Mindich Encounter with Authors, Center for Basic Research in the Social
Sciences, Harvard University (2005) (for *Polarized America*)
Encounter with the Authors, Center for Basic Research in the Social Sciences, Harvard
University (1999) (participant)
Emory University Conference on Institutions and Law-Making (2013)
European Political Science Association (2011-2013)
History and Congress Conference, Columbia University (2001,2002)
History and Congress Conference, Berkeley (2010)
History and Congress Conference, Brown University (2011)
History and Congress Conference, Stanford University (1999,2004)
History and Congress Conference, University of Georgia (2012)
Impact of Direct Democracy, University of Southern California and University of
California at Irvine (2005)
IGIER/PIER Conference on Political Economics, University of Pennsylvania (2002)
Macro-Politics of Congress, University of Colorado (2001)

Midwest Political Science Association (various years)
 National Bureau of Economic Research Summer Institute (2011)
 Northeastern Political Science Association (2002)
 Policy History Conference (2012)
 Political Accountability Conference, Princeton University (2002)
 Political Institutions and Economic Policy, Harvard University (2002, 2012)
 Political Institutions and Economic Policy, Princeton University (2013)
 Public Choice World Congress Plenary Speaker (2012)
 Public Choice Society (various years)
 Priorat Workshop on Theoretical Political Science (2013)
 Russell Sage Social Dimensions of Inequality Conference (2003)
 Social Science History Association (1998)
 Society for Political Methodology Summer Meetings (1997-1999)
 Southern California Political Economy Association (1995)
 Standing Group on Political Economy of the ECPR (2009)
 Stanford Institute of Theoretical Economics (1995)
State of the Parties: 1996 and Beyond, Ray C. Bliss Institute for Applied Politics (1997)
 University of George Elections Conference (2008, 2012)
Transformations of American Politics, Harvard University (2003,2004)
 W. Allen Wallis Political Economy Conference, Rochester University (1996,2002)

Invited Workshops

Academia Sinica (Taiwan) (2013)
 Bowling Green State University (2019)
 California Institute of Technology, Department of Humanities and Social Sciences (1992)
 Center for the Advance Study in the Behavioral Sciences (2005)
 Columbia University, Department of Political Science (1994, 1996, 2009)
 Columbia University Law School, Administration in the Age of Polarization (2015)
 ETH/ Zurich Risk Center Conference on Economic, Political, and Social Bubbles (2015)
 Harvard University, Department of Government (1998)
 Harvard University, Center for American Political Studies (2006)
 Hoover Institution, Stanford University (2000, 2005)
 Instituto Tecnológico Autónomo de México (2002)
 London School of Economics and Political Science (2009)
 Michigan State University, Department of Political Science (2002)
 New York University, Department of Politics (1998, 2001)
 New York University, School of Law (2002, 2016)
 Northwestern University, Department of Political Science (2003)
 Northwestern University, Managerial Economics and Decision Sciences (2010,2019)
 Nuffield College, Oxford University (2009)
 Ohio State University (1993, 2007)
 Princeton University (1992, 1998, 2000)
 Stanford University Political Science (2005,2016)
 Stanford University Graduate School of Business (1992,1994,1995,1999, 2016)

Stanford University Law School (2005)
 Universidad Extranada de Bogota (2000)
 University of California at Berkeley, Department of Political Science (2000,2004)
 University of California at Berkeley, Goldman School (2007)
 University of California at Davis (2016)
 University of California at Los Angeles, Department of Political Science (1995,1999)
 University of California at San Diego, Department of Political Science (2000)
 University of Chicago, Department of Political Science (2005)
 University of Chicago, Becker Friedman Institute, The Price of Policy Uncertainty (2015)
 University of Chicago, Harris School (2013,2019)
 University of Essex, Department of Government (2009)
 University of Essex, Political Economy (2009)
 University of Georgia (2010)
 University of Kentucky, Department of Political Science (2000)
 University of Michigan (2016)
 University of Minnesota, Department of Political Science (2006)
 University of Oregon, Department of Political Science (1996)
 University of Pittsburgh, Department of Political Science (2007)
 University of Rochester, Department of Political Science (1995,1996,1998,1999)
 University of Southern California, Marshall School of Business (1993, 2000)
 Washington University, Department of Political Science (1999)
 Yale University, Department Political Science (1992, 2002)
 Yale University School of Management (1993)

Referee Service

Academic Press, *American Economic Review*, *American Journal of Political Science*, *American Political Science Review*, *American Politics Quarterly*, *American Sociological Review*, Berkeley Electronic Press, *British Journal of Political Science*, *Business and Politics*, Cambridge University Press, Columbia University Press, *Comparative Political Studies*, *Economic Inquiry*, *Economics and Politics*, *Electoral Studies*, *European Economic Review*, *European Journal of Political Research*, *Governance*, *International Studies Quarterly*, *Journal of Economic Theory*, *Journal of Law and Economics*, *Journal of Law Economics and Organization*, *Journal of Institutional and Theoretical Economics*, *Journal of Political Economy*, *Journal of Politics*, *Journal of Public Economics*, *Journal of Public Economic Theory*, *Journal of Human Capital*, *Journal of Theoretical Politics*, *Legislative Studies Quarterly*, MIT Press, National Science Foundation, Oxford University Press, *Party Politics*, *Political Analysis*, *Political Behavior*, *Political Research Quarterly*, *Political Science Quarterly*, Princeton University Press, *Public Administration Review*, *Public Choice*, *Rand Journal of Economics*, *Review of Economics and Statistics*, Russell Sage Foundation Press, *Social Choice and Welfare*, *Social Problems*, University of Chicago Press, University of Michigan Press, *World Politics*.

Outside Professional Activities

Member of Methodology committee, SocialScienceOne
Chair, Appropriations Reform Subcommittee, APSA Panel on Congressional Reform
Chair, Working Group on the Politics of Social Media Platforms, Stigler Center, University of Chicago
Founding Editor-in-Chief, *Quarterly Journal of Political Science* (2005-2014)
Co-Chair, Anxieties of Democracy, Institutions Working Group, Social Science Research Council.
Steering committee, Anxieties of Democracy Program, Social Science Research Council.
Steering committee, SSRC/Deutsche Forschungsgemeinschaft program on Democracy.
Council member, *Midwest Political Science Association* (2009-2012)
Editorial committee, *Annual Review of Political Science*
Executive committee, Section on Political Economy, American Political Science Association (2004-2007)
Chair, U.S. Subcommittee of APSA Taskforce on Political Negotiation.
Program co-chair, 2005 Midwest Political Science Association Meetings.
Editorial board, *Political Science Research and Methods*
Editorial Board, *American Journal of Political Science*
Editorial Board, *Legislative Studies Quarterly*
Section Head, Political Economy, American Political Science Association Conference, 2002.
Instructor, *Political Game Theory*, European Consortium of Political Research Summer School, Ljubljana, Slovenia (2009 and 2010)
Instructor, National Science Foundation Program on Empirical Implications of Theoretical Models, University of Michigan (2006)
Instructor, National Science Foundation Program on Empirical Implications of Theoretical Models, Harvard University (2002)
Instructor, National Science Foundation Program on Empirical Implications of Theoretical Models, Washington University, St. Louis (2004, 2006)
Section Head, Parties and Interest Groups, Midwest Political Science Association, 2003.
Co-Leader, American Political Science Association MENA Workshop, Cairo Egypt, 2014.

Legal Consulting

Expert (written affidavits, court testimony) *Romo v. Detzner* 2012-CA-000412 (Fla. Cir. Ct., Leon County); Rebutted expert testimony challenging the legality of Florida congressional districting maps.

Expert (written affidavits) *NAACP v. Husted* Case 2:14-CV-404 (US District Court for the Southern District Ohio Eastern Division); Rebutted expert testimony concerning the impact of changes in early in-person voting procedures in Ohio.

Expert (written affidavits) *League of Women Voters of Florida, et al. v. Detzner, et al.*, Case No. 2012-CA-002842; Rebutted expert testimony challenging the legality of Florida state senate districting maps.

Expert (written affidavits, court testimony) *Ohio Democratic Party et al v. Husted et al.* Case 2:15-CV-1802 (US District Court for the Southern District Ohio Eastern Division); Rebutted expert testimony concerning the impact of changes in early in-person voting procedures in Ohio.

Expert (written affidavits) *One Wisconsin Institute, Inc. et al. v. Nichol, et al* Case:15-CV-324 (US District Court for the Western District of Wisconsin).; Rebutted expert testimony concerning the impact of changes in election administration in Wisconsin.

Expert (written affidavits, court testimony) *The Northeast Ohio Coalition for the Homeless, et al. vs. Jon Husted, et al.* Case 2:06-CV-00896. (US District Court for the Southern District Ohio Eastern Division). Rebutted expert testimony that changes to identification requirements on absentee and provisional ballots in Ohio have disproportionately reduced opportunities for minority voters to participate in elections.

Expert (written affidavits, court testimony) *League of Women Voters of PA et al., v. The Commonwealth of Pennsylvania et al.*, Civ. No. 261 MD 2017 (Commonwealth Court of Pennsylvania). Congressional districting litigation.

Expert (written affidavits, court testimony) *Agre et al. v. Wolf et al.*, Case 17-CV-4392 (United States District Court for the Eastern District of Pennsylvania). Congressional districting litigation.

Professional Memberships

American Political Science Association
Midwest Political Science Association
European Political Science Association

Appendix B: Description of Data Sources

1. Data from 98 Municipal RCV Elections

This dataset originated from the appendix of a report by the Maine Heritage Policy Center. The report is available at <https://mainepolicy.org/project/false-majority/>. To ensure the quality of the data, I consulted all of the original sources, but found no discrepancies. The online election results for five cases, however, were no longer available. These include three elections from Aspen, Colorado and two from Burlington, VT. The results of my analysis would not change if those cases were dropped. I updated the data by adding two elections in San Francisco from 2019. I am not aware of any other RCV elections that have occurred since the report for which ballot data is available. I supplemented these data in two ways. First, I tabulated the number of candidates (exclusive of write-ins). Second, I verified whether a non-monotonicity outcome was possible for the tabulation round with three candidates.

2. Cast Ballot Data from 2018 Maine 2nd Congressional District, Democratic Congressional Primary, Democratic Gubernatorial Primary, and 2020 Republican Congressional Primary

Data on the cast ballots for the 2018 and 2020 Maine elections is available from the Maine Secretary of State, Bureau of Corporations, Elections, and Commissions at <https://www.maine.gov/sos/cec/elec/results/results18.html#Nov6>. I wrote computer code to determine which ballots were exhausted and truncated. I then created aggregate percentage of exhausted and truncated ballots for each town.

3. Maine Voter file for 2018 Election

Counsel was able to obtain the Maine voter registration file containing the records of the voters who participated in the 2018 general election. The data was provided by The Data Trust <https://thedatatrust.com/>. The Data Trust merged the voter file with commercial data from Acxiom (<https://www.acxiom.com/>) on the education level of each voter. I was able to use this data plus the dates of birth provided in the voter file to generate age and education profiles for each of Maine's towns. I then matched these data to the aggregated cast ballot data. This data is available upon request from counsel.

4. Data on 2018 Maine State Senate Elections

Data on election returns for the 2018 Maine state senate elections is available from the Maine Secretary of State, Bureau of Corporations, Elections, and Commissions at <https://www.maine.gov/sos/cec/elec/results/results18.html#Nov6>.

5. Data on 2018 Congressional Elections in California and Washington

Data on California and Washington primary and general elections was obtained from the elections administration websites of each state. See <https://results.vote.wa.gov/results/20180807/Federal.html>;

<https://results.vote.wa.gov/results/20181106/Federal.html>;
<https://www.sos.ca.gov/elections/prior-elections/statewide-election-results/statewide-direct-primary-june-5-2018/statement-vote/>; <https://www.sos.ca.gov/elections/prior-elections/statewide-election-results/general-election-november-6-2018/statement-vote/>.

6. Data on Majority Runoff Primaries

The data from 1990 to 2002 was drawn from Engstrom, Richard L., and Richard N. Engstrom. 2008. "The majority vote rule and runoff primaries in the United States." *Electoral Studies* 27(3):407-416. The data were updated through the present using election returns reported online.